

CHAPTER 4. ENVIRONMENTAL EFFECTS

This chapter summarizes and compares the potential effects of each alternative on the physical, biological, and social environments in the South Deep project area.

4.1 Physical Environment

4.1.1 Soil Resources: Effects of the Alternatives

The following soils analysis is derived from the Soils Report for the South Deep Management Project and is available for review in the analyses file at the Three Rivers Ranger District office.

Alternative A – No Action

Direct and Indirect Effects

Alternative A defers activities in the South Deep Project area at this time. Detrimental soil conditions due to road construction, the construction of landings, and ground-based timber harvest would not occur.

Given the right conditions, an uncontrolled wildfire could occur under any alternative. However, the risk of an uncontrolled wildfire is greatest under Alternative A due to a large number of densely stocked timber stands and the build up of fuels that have accumulated in the past 70 years. Continued fire exclusion would allow fuels to accumulate on the forest floor, creating thick duff layers that probably affect soil microbiology, chemistry and nutrient cycling. Site nutrients would continue to migrate from the soil and high canopy to the forest floor and low canopy trees (Harvey, 1999). This shift in nutrient pool and organic matter load could make sites more vulnerable to nutrient losses from an uncontrolled wildfire.

Effects Common to Alternatives E and G

Direct and Indirect Effects

The nature of the impacts are similar between the two alternatives, but the extent (number of acres impacted) varies.

Construction of Temporary Roads, Landings, and Rock Pits

Ketcheson, Megahan, and King (1999) noted that “Numerous studies have shown that most sediment resulting from timber harvest activities is caused by erosion on forest roads associated with the harvest rather than by erosion on the areas disturbed by tree cutting and skidding.” Erosion from roads and landings may move into the fluvial system, impacting water quality and stream functions.

Regardless of soil type and site conditions, detrimental soil compaction and displacement always occurs on roads and landings. Both action alternatives would construct new temporary roads. However, the amount varies between the alternatives. All temporary roads would later be closed by ripping and planting. Temporary roads that would be constructed under both alternatives do not occur on soils that are sensitive with regards to road construction.

To the extent reasonable, both alternatives would use existing landings, but both alternatives would develop new landings as well. The number of landings and the acreage of land impacted by these landings vary between alternatives.

Both alternatives would develop 2 rock pits, impacting about 2 acres. Rock pits impact soil quality, although they generally are located in rocky areas with low inherent soil productivity.

The construction of roads, landings and rock pits is considered an 'irreversible effect' on soil productivity as described in 40 CFR 1502.16. Roads and landings can be obliterated and some productivity restored; however, full productivity would not be restored for many years until organic matter returns, the soil's ability to support root growth has redeveloped, an A horizon develops, and soil processes are re-established (Foth, 1984).

Decommissioning Classified Roads

Alternatives E and G propose to decommission about 6.6 miles of classified roads. Decommissioning includes removing any stream crossing structures, shaping as needed to allow proper drainage with no maintenance, ripping, planting, and closure. Most of the road segments to be decommissioned are less than one mile long.

Roads can be obliterated and some productivity restored; however, full productivity would not be restored for many years until organic matter is restored, soil tilth has redeveloped, an A horizon develops, and soil processes are restored (Foth, 1984). Ripping can reduce erosion and increase infiltration. Organic mulches are important first steps in restoring site productivity. However, obliterated roads can still produce sediment (Luce *et al.* 2001). Infiltration of ripped roads does not return to those found in undisturbed sites. Rocky soils with a high percentage of fine material result in lower rates of infiltration than sandy granitic material (Luce 1987).

Many of the roads are located on gravelly/sandy glacial material. These roads generally respond well to ripping, but may continue to erode unless mulched (Aits loam, Newbell silt loam, Donovan loam). Some of the roads are located on rocky material that may be more difficult to rip and revegetate (Huckleberry). Road 1700257 is located on Ahren loam, which is ashy over glacial material that is fine textured gravelly clay and gravelly clay loam. This road would be difficult to effectively rip.

Table 4-1. Roads To Be Decommissioned

Road	Miles	Soil	Comments
1700100	1.2	Aits loam	
1700150	1.0	Aits loam	
1700257	0.2	Ahren loam.	This road is already grown closed and no additional work would be done.
1700259	0.1	Aits loam.	
1700285	0.2	Newbell silt loam.	
1728051	0.3	Donavan loam	Rocky
1728110	0.2	Newbell silt loam.	Already ripped and seeded.
7000775	1.4	Newbell stony silt loam	Rocky.
7005790	0.8	Huckleberry silt loam.	Water seeping in cutslope.
7005830	0.9	Aits loam.	
7020500	0.2	Aits loam.	

Shaded Fuelbreak Construction

Both alternatives propose to develop shaded fuelbreaks along private land. Ninety-three acres of shaded fuelbreaks occur in both alternatives. Hand construction of shaded fuel breaks is not expected to cause compaction or erosion. This thinning of vegetation can result in both soil warming and an increase in soil moisture due to reduced evapotranspiration, and would create conditions favorable to the decomposition of organic matter and increased biologic activity (Grier et. al., 1989). Therefore, shaded fuelbreaks are not expected to cause detrimental soil conditions or impact soil productivity.

Pre-commercial Thinning

About 2,000 acres of pre-commercial thinning will occur in existing conifer plantations. Pre-commercial thinning does not disturb the ground; therefore these activities are not expected to impact long-term soil productivity.

Post and Pole Removal

Alternatives E and G include 130 acres of post and pole removal by members of the public under permit. The affected units are located along the upper part of Rocky Creek/Seldom Seen Mountain area. Soils in this area are Aits stony loam, Aits loam, Newbell stony silt loam, and Newbell silt loam, which all have a high compaction potential when moist. The post and poles would be removed using hand-labor and endlining to existing roads. Endlining to roads would impact the forest floor slightly, mixing soil and duff slightly, but this would not have a major effect on soil quality. Since ground-based equipment would not be used, post and pole removal is expected to have a negligible effect on soil quality.

Prescribed Fire as the Only Treatment

Both alternatives propose about 500 acres of prescribed fire in areas that are not being harvested. The number varies between alternatives because fire is prescribed in some areas that are timber harvest units in one alternative, but are not in the other. The effects of fire on soils are numerous and highly variable depending on the type and intensity of the fire and the amount of surface fuels consumed. Fire is a natural process in these forests and presumably soil processes are capable of handling many of the changes produced by fire. Prescribed fires would occur under controlled conditions so as to yield a low to moderate intensity fire.

Prescribed fire at all intensity levels burns some of the forest floor material and duff. Complete duff and litter removal would cause surface erosion (Harvey *et al.* 1994). The surface soils in this analysis typically have gravelly and stony silt-loam textures, which are susceptible to raindrop impacts, surface sealing, and increased runoff. Low and medium intensity fires burn only part of the duff and litter, leaving adequate soil cover over the majority of the site. In general, low and medium intensity fires burn only part of the duff and litter, leaving adequate soil cover over the majority of the site. The fires prescribed in both alternatives E and G are expected to burn the duff and litter in small, discontinuous patches throughout the prescribed burn areas. Because of their small size (<100 square feet), these areas are not expected to degrade long-term site productivity. These areas are also not expected to contribute sediment to nearby streams because they would have a discontinuous pattern across the landscape.

Burning kills many kinds of bacteria, fungi and arthropods but the extent of this effect is dependent on the amount of heat generated by the fire and the moisture content of the soil (Hungerford *et al.*, 1991). In addition, several researchers recommend preserving soil carbon to maintain biologic activity (Harvey *et al.*, 1994; Stark and Hart, 1999), and suggest creating a lot of heterogeneity in burned areas to provide the micro-flora and -fauna opportunities to reinvade these areas (Moldenke, 1999). The prescribed fire proposed under Alternatives E and G would be light intensity with small areas of medium intensity, retaining unburned islands. This kind of burn would not have a long-term adverse impact on soil biota.

The primary detrimental soil condition due to prescribed fire would be erosion, because some of the duff and forest floor material would be consumed. These areas are expected to be small and scattered. Overall detrimental soil conditions from these treatments would be about 1-2%.

Commercial Timber Harvest Using a Ground-Based Logging System

Compaction, Displacement and Erosion

The most common soil impacts from commercial timber harvest using ground-based logging systems is compaction, displacement and erosion. Severe erosion removes nutrient-rich topsoil, thereby reducing soil productivity. Reviews of past harvest units in this planning area did not find areas of erosion large enough or severe enough to meet the criteria for detrimental soil conditions. Monitoring on the Colville National Forest has seldom found erosion in areas large enough or severe enough to meet the criteria for detrimental surface erosion (N. Glines, personal observation).

Tractor yarding: With tractor yarding, the skid trails will experience detrimental compaction regardless of soil characteristics, unless ameliorating conditions exist such as snow or frozen ground. The project designates the minimum skid trail spacing. The number of skid trails is generally independent of the timber volume to be removed, and the number of passes on each trail would increase as the volume removed increases. Maximum compaction typically occurs in the first 1-3 passes, so the amount of compaction would not increase as the volume removed increases. With 130-foot skid trail spacing, this project would detrimentally compact about 10% of the activity area. This project would require all heavy equipment to remain on the designated skid trails, which would limit the extent of detrimental soil conditions.

Tractor skid trails are typically bare, because the tractor drags the logs on the trail¹. The soil in these skid trails is also compacted, and the soil structure destroyed. Because of the slope limitations for tractor logging (35%), none of the soils with high surface erosion potential would occur on tractor skid trails. The

¹ Logging over snow does not bare the skid trail.

project includes measures to minimize erosion on skid trails such as water bars and seeding. Because erosion is limited to skid trails, erosion does not contribute to the extent of detrimental soil conditions. Displacement occurs in combination with compaction on roads, skid trails and landings. While displacement may add to the overall detrimental conditions, it does not increase the extent of detrimental soil conditions.

Cut-to-length yarding (CTL): The compaction in CTL trails is strongly related to the amount of slash or snow buffering the trail, and the number of passes by the heavy forwarder. CTL systems, with proper slash buffering, do not create detrimental conditions on the entire skid trail. Monitoring on soils that are easily compacted (Waits loam, Z-Slumber Timber Sale) found that about 40% of the main CTL trails and 15% of the secondary trails were detrimentally compacted. It is likely that soils with a moderate compaction potential would experience slightly lower levels of compaction on secondary trails. High timber volume removed may mean more trips on each trail by the forwarder which would increase compaction slightly. Mitigation is included to prevent the use of a CTL system unless the unit has sufficient slash or snow. With sufficient slash or snow, a CTL activity area would experience about 8-12% detrimental compaction. The main tractor and CTL trails are likely to remain compacted for a long time and probably constitute an 'irreversible effect' on soil productivity as described in 40 CFR 1502.16. Areas of very light tractor skidding (single pass, over slash, dry conditions), or light CTL use (1 to 3 passes, over very good slash bed) are expected to decompact over a period of 30-50 years.

CTL machines that place a mat of slash before them do not bare the soil and subject it to erosion (N. Glines, personal observation). Erosion is rarely observed on CTL trails.

Soil Biology and Nutrient Cycling

Clearcuts with reserve trees and shelterwood prescriptions would leave a more open stand. On exposed south or western aspects, these treatments may increase stand temperatures, increase soil moisture, and favor decomposition of the duff and soil organic matter. The amount of duff and soil organic matter would decline slightly, consistent with the stand characteristics. Both alternatives propose some shelterwood treatments. The changes in soil temperature, moisture regime, and the amount of organic matter are not detrimental to long-term site productivity.

Neither alternative proposes to simplify composition of vegetation on the forest floor. Logging and tree removal alone does not remove the organic material on the forest floor. All alternatives retain the larger trees, which when they die and fall down provide the refugia needed, especially on drier sites. Nutrient loss from the removal of the boles of trees is typically small and can be replaced through the course of a rotation (Spurr and Barnes, 1980; Grier et al., 1989).

High intensity fires may volatilize soil nutrients such as nitrogen and sulfur. The fire intensity proposed in Alternatives E and G would not be high enough to volatilize a large amount of these plant nutrients. Because of the amount of organic matter to be left on the site, a large amount of leaching is also not expected to occur under either alternative.

The primary detrimental soil condition would be from compaction. Overall detrimental soil conditions would be about 9-10%. Minor changes in soil biology may occur, however, these are consistent with the changes in stand conditions and are not detrimental soil conditions.

Commercial Timber Harvest Using a Cable or Skyline Logging System

Disturbance and Erosion

The primary effect of commercial logging with a cable system is disturbance especially just below the landing. Dryness (1967) found skyline harvesting disturbed about 6% of the site. Smith and Wass (1977) measured 7.6% disturbance. McIver et al. (1998) measured about 7% disturbance under skyline yarding systems. Soil disturbance is typically concentrated in cable corridors. Most of the disturbance found was shallow mixing of duff and surface soils, which would not be detrimental soil conditions as defined by the Forest Plan. Some areas of exposed and rutted soil may occur, especially just below the landing. These areas are usually small and discontinuous. Monitoring on the Colville National Forest has found detrimental soil conditions in skyline units is typically 0.5-3%. The review of detrimental soil conditions in

past treatment areas for this project looked at one skyline unit and found detrimental soil conditions were 0.5%.

Soil Biology and Nutrient Cycling

The effects of timber removal on soil temperatures, moisture, and biology are similar to that discussed in the above section. A Cable or skyline logging system would result in a stand with a great deal of diversity and the forest floor would remain intact.

The primary detrimental soil conditions that occur on skyline units are bare soil and erosion. Detrimental soil conditions would be about 1-2%.

Commercial Timber Harvest Using a Helicopter Logging System

Helicopter yarding typically produces very low levels of detrimental soil conditions and has fewer resource impacts than other yarding systems. Excluding the landing, compaction generally does not occur (Alexander and Poff 1985; Fredrickson and Harr 1979). Helicopter yarding produces less disturbance than skyline yarding (Dryness 1972). Under a helicopter yarding system, a group of logs is cabled together and lifted. The logs move laterally until they are airborne. The Forest soils scientist has observed some amount of duff mixing from this lateral movement, but this duff mixing would not constitute a detrimental soil condition. Helicopter logging would result in a stand with a great deal of micro-flora and –fauna diversity and the forest floor would remain intact. The primary detrimental soil conditions that occur on helicopter units are bare soil and erosion. Detrimental soil conditions would be less than 1%.

Jackpot Burning in Harvest Units

The primary impact of jackpot burning to soils would be a minor increase in erosion from the removal of soil cover. In jackpot burning, concentrations of slash are burned. Small areas may burn hot enough to remove most of the soil cover, but these areas are typically small (less than 100 ft) and dispersed across the unit. Material eroded from these ‘hot spots’ would not be moved off the site, but would be deposited onto adjacent unburned and lightly burned areas. Jackpot burning maintains soil carbon and biologic activity because it leaves a lot of heterogeneity in burned areas by only burning fuel concentrations (Harvey et al. 1994; Moldenke 1999; Stark and Hart 1999).

Mechanical Fuel Treatments and Grapple Piling

The primary effect of mechanical fuel treatments is compaction. Mechanical fuel treatment equipment typically has low ground pressure, and only passes over the ground once². This equipment stays on designated skid trails. Therefore, these activities would not increase the amount of detrimental soil conditions in tractor yarded units. In cut-to-length units however, this additional piece of equipment has the potential to increase the amount of compaction on the cut-to-length trails. Whether this occurs, and to what extent, depends on the amount of slash on the trail. Cut-to-length operations may experience a small increase in detrimental soil conditions due to mechanical fuel treatments.

‘Lop and Scatter’, Whip Felling, and Handpiling Slash

Lop and scatter, whip felling, and handpiling slash do not involve heavy equipment. No detrimental soil conditions occur as a result of these activities.

Combined Treatments

Many of the treatment areas will experience more than one treatment. Typically commercial timber harvest includes both the harvest and some fuel treatment. Some of the units will also have shaded fuelbreaks within commercial timber harvest areas. Detrimental soil effects are typically additive. Compaction/erosion/displacement on skid trails is far and away the most common detrimental soil

condition associated with the action alternatives. Mechanical fuel treatments generally do not increase the amount of detrimental soil conditions because the equipment is limited to the existing skid trails.

Table 4.2 Expected Detrimental Soil Conditions of Combined Treatments for Commercial Timber Removal

Silvicultural Prescription	Yarding system	Fuel Treatments		
		No Fuels Treatment, handpile, whip felling, and lop & scatter	Mechanical (MTSI) and grapple pile	Jackpot burn and underburn
Salvage, commercial thinning, overstory removal	Tractor	8-10%	8-12%	10-12%
	Cut to Length	8-10%	8-12%	8-10%
	Cable	1-3%	NA	1-3%
	Helicopter	<2%	NA	<2%
Irregular shelterwood, shelterwood, clearcut with reserves, and uneven-aged management	Tractor	9-12%	9-12%	9-12%
	Cut to Length	8-10%	8-12%	8-10%
	Cable	1-5%	NA	1-5%
	Helicopter	<1%	NA	<1%

Cumulative Effects

Timber Harvest

Cumulative effects occur when past, present and on-going activities combine with the actions of the alternatives to produce results that are different than the direct effects. Across the landscape, the most common causes of existing detrimental soil conditions are past logging, recreation, and livestock grazing. Within the proposed treatment areas, past logging was overwhelmingly the primary cause of detrimental soil conditions.

The effects of past activities combined with the actions of the alternatives are not always additive. The detrimental soil conditions found in these units are typically from past logging; roads (both classified and unclassified), skid roads, skid trails, and landings. In many cases, the remnant logging features are suitable for reuse. The higher the level of existing detrimental soil conditions, the more features are generally available to be reused. Where roads, trails, and landings are reused, total detrimental soil conditions would increase by something less than the 8-10% increase from the direct effects. Each proposed harvest area was reviewed to consider whether existing landings, roads, skid trails, etc. would be likely to be reused during this entry. The following table displays a summary of this analysis.

Table 4.3 Summary of Cumulative Effects Expected

Harvest Treatments	Existing Detrimental Soil Condition	Typical Direct increase in Detrimental Soil Condition	Estimated Resulting Detrimental Soil Condition
Commercial timber harvest with a tractor or cut-to-length, followed by mechanical fuel treatment, grapple piling, lop and scatter, handpiling, jackpot burning, or no additional fuel treatment.	0-5%	8-12%	9-12%
	5-10%		10-16%
Commercial timber harvest with a cable or helicopter system, followed by lop and scatter, handpiling or jackpot burning, or no fuel treatment.	0-5%	0-3%	0-5%
	5-10%		5-10%

Units where the existing detrimental soil conditions exceeded 10% were reviewed on a case by case basis. The following units occur in both alternatives.

Unit DBK is a tractor unit. The existing detrimental soil conditions are about 17% -- mostly compaction from old skid trails that extend through the unit. The unit is only 6 acres. The soils in this unit are Donovan stony loam, the compaction potential is moderate. The proposed treatment is uneven-aged management (HSL) with the tops removed, followed by a jackpot burn. There is an existing landing on the road along side the unit, and one main skid trail that is suitable to reuse. Unfortunately, the skid trail does not lead to this landing. Winter logging is recommended for this unit. With winter logging, the purchaser can use the existing landing and modify the skid trails. With suitable snow and the reuse of the existing landing, detrimental soil conditions are expected to remain near the current conditions or about 17-19%. With mitigation this unit is expected to meet the Forest Plan standards for soil conditions.

Unit DCD is a 58 acre tractor unit. The soils are Bonner silt loam, Newbell silt loam, Martella silt loam, and Aits loam – all soils with a high potential for compaction when moist. The existing detrimental soil conditions are 11%, due to a combination of the number of classified roads that go through the unit, and compaction on old landings and skid trails. The proposed treatment is overstory removal and commercial thinning, followed by grapple piling of the slash. This unit has several landings that can be reused. Much of the unit could be endlined to the existing roads and skid trails. About 4,000 acres of new skid trail would probably be developed, increasing the detrimental soil conditions in this unit to about 12-13%. This unit would continue to meet the Forest Plan standards for soil conditions.

Unit DCI is a 26 acre tractor unit. The soils are Bonner silt loam and Martella silt loam; both soils have a high potential for compaction when moist. Existing detrimental soil conditions make up 13% of the unit – mostly compaction from very old skid trails. The proposed treatment is uneven-aged management (HSL). The material would be yarded with the tops attached and piled at the landing. Following logging, the fuels would be treated with a mechanical treatment like a slash-buster. There is a road along one side of the unit, and a road that crosses part of the unit. This unit also has some wet areas that would be avoided. This unit does not have a good skid trail system that can be reused. Winter logging is recommended for this unit. With suitable snow, detrimental soil conditions are expected to increase by about 1-2% to about 14-15%. With mitigation this unit would meet the Forest Plan standards for soil conditions.

Unit DCT is a 14 acre tractor unit. The soils are Newbell silt loam, and Aits loam. The compaction potential is high when moist. Currently, detrimental soil conditions make up about 11% of the unit, due to the presence of an old road and scattered skid trails. The proposed treatment is commercial thinning and shelterwood, followed by grapple piling. While the old road can be reused, the old skid trails are too scattered and do not make a good skid trail system. Winter logging is recommended. With suitable snow, detrimental soil conditions are expected to increase by about 1-4% to about 12-15%. With mitigation this unit would meet the Forest Plan standards for soil conditions.

Unit DFC is a 38 acre tractor unit. The soils are Huckleberry silt loam, and Aits loam. Huckleberry has a compaction potential of moderate, and Aits has a compaction potential of high. The existing detrimental soil conditions are about 13% of the unit due to old skid trails. The proposed treatment is commercial thinning with the tops attached. This unit has two classified roads that go through it, cutting the unit roughly into thirds. The roads would certainly be reused, but the old skid trails are too scattered and don't add up to a good skid trail system. Winter logging is recommended. With suitable snow, detrimental soil conditions are expected to increase by about 1-3% to about 14-16%. With mitigation this unit would meet the Forest Plan standards for soil conditions.

Unit NBW is a 29 acre tractor unit. The soils are Merkel stony sandy loam, and Donavan loam. The compaction potential is moderate. The existing detrimental soil conditions make up about 12% of the unit. The proposed treatment is uneven-aged management (HSL). Yarding would occur with the tops attached. The fuel would be treated with a jackpot burn. There is a road at the bottom of the unit, and the unit is pretty long. The powerline corridor extends along one side of the unit. The old skid trails are too scattered and do not make a good pattern to log this unit. Winter logging is recommended. With suitable winter conditions, detrimental soil conditions are expected to increase by about 1-3% to about 13-16%. With mitigation this unit would meet the Forest Plan standards for soil conditions.

Unit SDQ is a 120 acre tractor unit. The soils are Newbell stony silt loam; the compaction potential is high when moist. Existing detrimental soil conditions make up about 14% of the unit, due to old unclassified roads, skid trails, and landings. The proposed treatment is a combination of commercial thinning, irregular shelterwood, and sanitation, followed by grapple piling. There is an old unclassified road that meanders through the unit, and some old landings and skid trails in the upper part. There are some wet areas in the lower part, which would be avoided. The old roads could be reused, but it is not clear that they are the best way to access the unit. Some of the landings could be reused, but they are not well distributed. Winter logging is recommended. With suitable snow conditions, detrimental soil conditions are expected to increase by about 1-3% to about 15-17%. With mitigation this unit would meet the Forest Plan standards for soil conditions.

Unit WGP is a 31 acre tractor unit. The soil is Belzer silt loam; compaction potential is high when moist. Currently, detrimental soil conditions are found on about 11% of the unit; primarily due to a classified road that zags through the unit. The proposed treatment is uneven-aged management, leave tops attached, followed by a mechanical fuel treatment. The classified road access most of the unit. About 4,500 feet of new skid trail would be needed to access the areas more than 130 feet from the road, and two new landings would need to be constructed. These would increase the detrimental soil conditions by about 5% to about 16%. This unit would continue to meet the Forest Plan standards for soil conditions.

Ongoing Recreation Activities

The action alternatives propose tractor units that are adjacent to OHV-used roads, dispersed campsites and Big Meadow Campground. Although it is uncommon for OHV use to become established on closed skid trails, if this use does occur, it would result in continued erosion from the skid trails. Continued erosion would prevent vegetation from becoming established, and would eventually destroy the waterbars. The risk of OHV use increases as the number of harvest units adjacent to OHV-used roads increases. The action alternatives include practices to discourage OHV riding on skid trails.

Soil Productivity

The following table summarizes Alternatives E and G's effects on soil productivity.

Table 4.4 Effects on Soil Productivity

	Alternatives	
	E	G
Changes in site productivity due to road and landing construction		
Acres of landings to be constructed	51	69
Effects of constructing roads and landings		
Acres of new road to be constructed		
Permanent new road construction	0	29.5
Temporary new road construction	7.5	11
Total acres where soil productivity is severely reduced due to the construction of roads and landings	58.5 acres	109.5 acres
Effects of logging		
Total acres to be yarded with a ground-based system.	3,253	5,215
Acres of detrimental soil conditions due to ground-based logging	325 acres	521 acres
Effects from burning		
Total acres to be treated with fire		
Jackpot Burning	1,130	1,630
Underburning	910	960
Acres of detrimental soil disturbance due to prescribed fire.	20 acres	26 acres

Effects Unique to Alternative E

Direct and Indirect Effects

Timber Harvest Activities

Alternative E proposes 4,612 acres of commercial timber harvest; 71% would be yarded with a ground-based system. The majority of the units proposed for treatment occur in both alternatives and effects for units in common are discussed in the previous section. The primary difference between the alternatives is not the specific effects, but the number of acres to which they apply.

Fifteen units, totaling 408 acres, occur in alternative E but not in alternative G. The following table summarizes the conditions in these units. No special or unique conditions occur in these units which would yield effects that are different than described in the effects common to both alternatives. The

existing detrimental soil conditions in units DBI and DFZ are greater than 10%. The cumulative effects in these units are discussed in the next section.

Table 4.5 Units that occur in Alternative E but not in Alternative G

UNIT	Proposed Treatment	Soils Present
DBF	98 ac. tractor; commercial thinning, jackpot burn	Newbell-rock outcrop complex, Newbell stony silt loam,
DBI	66 ac. tractor, 10 ac. cable; uneven age mgt, leave tops attached	Newbell stony silt loam, Newbell silt loam, Aits loam, Newbell-rock outcrop complex
DBL	14 ac. tractor; commercial thinning, leave tops attached	Aits stony loam, Moscow-rock outcrop complex
DBW	4 ac. tractor; shelterwood, grapple pile	Aits loam
DCP	19 ac. tractor; commercial thinning, leave tops attached/mechanical timber stand improvement	Aits stony loam, Huckleberry-rock outcrop complex
DCQ	46 ac. tractor; uneven age mgt, leave tops attached/mechanical timber stand improvement	Aits stony loam, Aits loam, high precipitation, Moscow-rock outcrop complex, Newbell silt loam
DCZ	26 ac. tractor; commercial thinning/shelterwood, leave tops attached/mechanical timber stand improvement /grapple pile	Aits stony loam, Moscow-rock outcrop complex,
DDM	4 ac. tractor; commercial thinning, leave tops attached	Huckleberry-rock outcrop complex, rock outcrop-Aits complex
DDN	4 ac. tractor; commercial thinning, leave tops attached	Aits loam, Huckleberry-rock outcrop complex, Buhrig-rock outcrop complex
DFB	25 ac. tractor; commercial thinning /shelterwood, leave tops attached /grapple pile	Aits loam, Huckleberry-rock outcrop complex
DFM	7 ac. cable; commercial thinning, leave tops attached	Aits loam, Buhrig-rock outcrop complex
DFT	15 ac. tractor; uneven age mgt, leave tops attached/mechanical timber stand improvement	Aits stony loam, rock outcrop-Aits complex
DFZ	10 ac. tractor; commercial thinning, leave tops attached /jackpot burn	Newbell-rock outcrop complex, Aits loam, Newbell stony silt loam
DGA	37 ac. tractor; commercial thinning /overstory removal, leave tops attached / mechanical timber stand improvement	Aits loam, Newbell stony silt loam, Moscow silt loam
NBT	25 ac. tractor; uneven age mgt, leave tops attached	Donavan-rock outcrop complex

Unit ECF: In alternative E unit ECF would be logged with a cable system, in alternative G it would be logged with a tractor. Unit ECF is flat enough to log with a tractor, but it does not have a road to the bottom. Existing detrimental soil conditions are 10%. The soils are Aits loam and Huckleberry silt loam.

- Alternative E would log with a cable, but grapple pile the slash. Because of the shape of the unit, the soil scientist estimates that Alternative E would require the construction of 2 new landings. Because of the flat slopes, suspension of the logs would not be very good. The estimated final detrimental soil conditions in this unit under this treatment would be about 15-17%. A lot of the detrimental soil conditions would be due to scraping, bare soil, and shallow compaction from grapple piling.

- Alternative G would build about 0.4 miles of new road to access the bottom and construct one landing. Because of high existing detrimental soil conditions, and because it does not have a skid trail system suitable for this proposed action, alternative G would log this unit in the winter over snow or frozen conditions, and would not pile the slash. The estimated final detrimental soil conditions in this unit under this treatment would be about 12%.

Unit WFL: In alternative E unit WFL would be logged with a helicopter, in alternative G it would be logged with a cable. The unit has a mid-slope road through the unit. Existing detrimental soil conditions are 1%, and the soils are Newbell stony silt loam and rock outcrops.

- Alternative E would log with a helicopter, followed by jackpot burning and prescribed fire. The helicopter landing would be shared with other helicopter units, and would not be located within or adjacent to the unit. The estimated final detrimental soil conditions would be about 1-2%, which is a slight increase due to the prescribed fire.
- Alternative G would yard the timber with a cable system, followed by jackpot burning and prescribed fire. With landing construction and some impacts from both cable logging (scraping and bare soil) and prescribed burning (patches of bare soil), the estimated final detrimental soil conditions would be about 3-5%.

Temporary Roads and Landings

Alternative E proposes 7.5 miles of temporary roads. None of the temporary roads proposed are unique to Alternative E. The effects of temporary road are described in the previous section. About 7.5 acres would be impacted by temporary road construction.

Alternative E would require about 250 landings. Based on an individual unit review, about 18% of the landings would utilize existing roads and landings. About 51 acres would be developed into landings for this alternative.

Shaded Fuelbreaks

Alternative E proposes to develop 47 acres of shaded fuelbreaks in areas that Alternative G would treat with prescribed fire. Since shaded fuelbreaks are constructed by hand, they do not cause detrimental soil conditions.

Prescribed Fire

Alternative E proposes about 913 acres of prescribed burning. Most of this burning is common to both alternatives. About 547 acres is fuel treatment burning not in timber harvest units, and 366 is located within timber harvest units. Alternative E proposes prescribed fire on 26 acres that are proposed for timber harvest and prescribed fire in Alternative G. No special or unique conditions occur in these units which result in effects that are different than those described in the effects common to both alternatives.

Jackpot burning

The primary impact of jackpot burning to these soils would be a minor increase in erosion from the removal of soil cover.

Cumulative Effects

Timber Harvest

Unit DBI would harvest 76 acres, 66 acres with a tractor and 10 acres with a cable. The soils are Newbell stony silt loam, Newbell silt loam, and Aits loam, which all have a high compaction potential when moist. Existing detrimental soil conditions are 13% due to old logging and a classified road that goes through the unit. The proposed treatment is uneven-aged management with the tops attached.

There are some old skid trails scattered, but not a good logging pattern. The purchaser can use some of the existing landings. Winter logging would be required in order to meet the Forest Plan standard for detrimental soil conditions. With suitable snow and the reuse of the existing landing, detrimental soil conditions are expected to remain near the current conditions or about 15-17%. With mitigation this unit is expected to meet the Forest Plan standards for soil conditions.

Unit DFZ is a 10 acre tractor unit. The soils are Newbell stony silt loam, and Aits loam. The unit has some rocky areas. The compaction potential is variable, containing areas of high potential and moderate potential. The existing detrimental soil conditions are 14%. The skid trails present are very scattered. The proposed treatment is commercial thinning, leave the tops attached, followed by a jackpot burn. Winter logging would be required in order to meet the Forest Plan standard for detrimental soil conditions. With suitable snow and the reuse of the existing landing, detrimental soil conditions are expected to be about 15-18%. With mitigation this unit is expected to meet the Forest Plan standards for soil conditions.

The following table summarizes cumulative effects that would occur under Alternative E.

Table 4-6. Summary of Cumulative Effects Unique to Alternative E				
# of units and acres common to both alternatives	# of units and acres that occur only in Alt. E	Existing Detrimental Soil Condition	Proposed Treatments	Estimated Resulting Detrimental Soil Condition
61 units / 2,310 ac.	4 / 62 ac.	0-5%	Commercial timber harvest with a tractor or CTL, followed by mechanical fuel treatment, grapple piling, lop and scatter, handpiling, jackpot burning, or no additional fuel treatment.	9-12%
15 units / 523 ac.	3 / 121 ac.	5-10%		10-15%
15 units / 781 ac.	7 / 163 ac.	0-5%	Commercial timber harvest with a cable or helicopter system, followed by lop and scatter, handpiling or jackpot burning, or no fuel treatment.	0-5%
0 units / 0 ac.	0 / 0 ac.	5-10%		5-10%

Ongoing Recreation Activities

Alternative E proposes 26 tractor units adjacent to OHV -used roads, dispersed campsites and Big Meadow Campground. Although, it is uncommon for OHV use to become established on closed skid trails, if this use does occur, it would result in continued erosion from the skid trails. Continued erosion would prevent vegetation from becoming established, and would eventually destroy the waterbars. The risk of OHV use increases as the number of harvest units exposed increases.

Effects Unique to Alternative G

Direct and Indirect Effects

Timber Harvest

Alternative G proposes 7,121 acres of commercial timber harvest; 73% would be yarded with a ground-based system. The majority of the units proposed for treatment occur in both alternatives and the effects for units in common are discussed in “Effects Common to Alternatives E and G”. The primary difference between the alternatives is not the specific effects, but the number of acres to which they apply.

Fifty units, totaling 2,919 acres, occur in Alternative G but not in Alternative E. No special or unique conditions occur in these units which would yield unique direct or indirect effects. The direct and indirect effects common to both alternatives apply to these units as well. The existing detrimental soil conditions in unit WFT are greater than 10%. The cumulative effects of this unit are discussed in the next section.

The logging system for units ECF and WFL is different in alternative G than in alternative E. These differences were described in the previous section.

Temporary Roads and Landings

Alternative G proposes 3.2 miles of temporary roads. The effects of temporary roads are described in the previous section. About 11 acres would be impacted by temporary road construction. The temporary roads that occur in Alternative G but not in Alternative E do not occur on soils that are sensitive with regards to road construction.

The soil scientist estimates that Alternative G would require about 300 landings. Based on an individual unit review, an estimated 15% of the landings would utilize existing roads and landings. About 63 acres would be developed into landings for this alternative.

Permanent Road Construction

The construction of permanent roads is considered an ‘irreversible effect’ on soil productivity as described in 40 CFR 1502.16. Roads can be obliterated and some productivity restored; however, full productivity would not be restored for many years until organic matter is restored, soil tilth has redeveloped, an A horizon develops, and soil processes are restored (Foth, 1984). Alternative G proposes 4.9 miles of new permanent road construction, occupying about 29 acres of National Forest System lands.

Prescribed Fire

Alternative G proposes about 960 acres of prescribed burning. Most of this burning is common to both alternatives. However, Alternative G proposes prescribed fire on 47 acres, where Alternative E proposes shaded fuelbreaks. These areas are part of units DCA, DCS, ECC, ECE and ECH. No special or unique conditions occur in these areas which would result in effects that are different from those described in the effects common to both alternatives.

Jackpot burning

The primary impact of jackpot burning to these soils would be a minor increase in erosion from the removal of soil cover.

Cumulative Effects

Timber Harvest

Table 4.7 Summary of Cumulative Effects Unique to Alternative G				
# of units and acres common to both alternatives	# of units and acres that occur only in Alt. G	Existing Detrimental Soil Conditions	Proposed Treatments	Estimated Resulting Detrimental Soil Conditions
61 units / 2,310 ac.	32 units / 2,230 ac.	0-5%	Commercial timber harvest with a tractor or CTL, followed by mechanical fuel treatment, grapple piling, lop and scatter, handpiling, jackpot burning, or no additional fuel treatment.	9-12%
15 units / 523 ac.	5 units / 174 ac.	5-10%		10-15%
15 units / 781 ac.	12 units / 478 ac.	0-5%	Commercial timber harvest with a cable or helicopter system, followed by lop and scatter, handpiling or jackpot burning, or no fuel treatment.	0-5%
0 units / 0 ac.	0 units/ 0 acres	5-10%		5-10%

Unit WFT is a 36 acre helicopter unit. The soils are Newbell stony silt loam and Belzar loam and the compaction potential is high when moist. The existing detrimental soil conditions are 11%. The proposed treatment is irregular shelterwood and uneven-aged management, with no fuel treatment. Since this is a helicopter yarding method, the detrimental soil conditions are expected to stay about the same; 11-12%. This unit would continue to meet the Forest Plan standards for soil conditions.

Ongoing Recreation

Alternative G proposes 41 tractor units adjacent to OHV-used roads, dispersed campsites, and Big Meadow Campground. Although, it is uncommon for OHV use to become established on closed skid trails, if this use does occur, it would result in continued erosion from the skid trails. Continued erosion would prevent vegetation from becoming established, and would eventually destroy the waterbars. The risk of OHV use increases as the number of harvest units exposed increases.

4.1.2 Hydrology: Effects of the Alternatives

The following hydrology analysis is derived from the Hydrology Report for the South Deep Management Project and is available for review in the analyses file at the Three Rivers Ranger District office.

Riparian areas typically are a reflection of the overall health of the watershed and are critical to the well being of the communities who depend on them. These areas are usually among the most sensitive landscape features within a watershed, and also the first to show damage from improper management. While they cover only a small portion of the total analysis area, they nevertheless provide a

disproportionate amount of public benefit in the form of wildlife habitat, recreation, clean water, and aquifer re-charge.

Alternative A – No Action

Direct and Indirect Effects

Water Quality

Existing roads will continue to contribute sediment to streams and riparian areas from cuts, fills, and the road travel way at road/stream crossings and where roads are located adjacent to streams. Currently there are a total of 168 known road/stream crossings within the project area. The erosion model indicates that approximately 191 tons of sediment is delivered annually at these crossings from existing riparian roads in the project area. Based on the Washington Department of Natural Resources erosion model, county roads account for 35% (South Deep Tribes) to 44% (Meadow Creek and Rocky Creek) of the total existing sediment delivery from all roads in the project area. This is due to their close proximity to streams and wetlands, higher traffic levels, and wider travel ways. There will be a continued risk of road and crossing failures within the project area due to impeded drainage when cutslope slumps fill ditch lines. Some existing culverts on forest roads were installed a long time ago and are reaching the end of their normal life expectancy. This condition will be aggravated by decreased road maintenance budgets for Forest Service roads in the future. These impacts are most likely to occur in the drainages with the highest crossing densities and along riparian roads located on low slope positions. The Geographic Information System (GIS) estimates that there are currently 68 acres of road/stream crossings within project area riparian habitat conservation areas. (Source: Three Rivers District GIS mapping)

Continued logging on low elevation private lands will offset some of the decreases in created openings on federal lands under the No Action Alternative. The long term sustainability of the current harvest levels on non-federal land is unknown. Road construction, maintenance, and haul traffic associated with logging on private and state lands will continue to deliver sediment to area streams. This will primarily affect Harrier Creek and the low elevation reaches of Rocky Creek, Meadow Creek, and the mainstem of the South Fork of Deep Creek. Future road use on state and private lands is expected to remain similar to current levels.

No short-term measurable direct or indirect adverse impacts to stream temperatures and fecal coliform bacteria are anticipated under this scenario. Vegetative shade will increase slightly as stocking levels and tree heights increase on federal lands due to a lack of timber harvest and road construction. This will result in small decreases in water temperature, but such changes will be difficult to measure and are expected to remain within existing ranges of variation. Increases in vegetation will also limit cattle access to riparian areas and may reduce that source of fecal coliform bacteria. In addition to cattle, wildlife, recreationists, and local residents will continue to provide a source of fecals to area streams.

Roads on Forest Service lands will continue to be used for grazing, fire suppression, and recreational purposes. These roads will receive periodic maintenance, especially the arterials needed for public access. Collector and spur roads will receive less or no maintenance. Many are already closed to full-sized vehicle traffic and are being allowed to close naturally with vegetation. Ongoing road maintenance and existing traffic use will continue to introduce sediment to area streams from Forest Service roads.

The increasing popularity of off-highway vehicles (OHV's) will continue to affect streams and wetlands in the future. This will be evident especially along old roads that the Forest Service has closed to full-sized vehicles, but which are still being used by OHV's for hunting and general recreation. OHV impacts will be similar to those of full-sized vehicles--primarily sedimentation, but may also include small increases in fecal bacteria. Most impacts will occur at stream crossings and where old roads provide access to low gradient streams and wetlands. The forest is currently developing an off-road vehicle strategy which will address the use of these vehicles on the national forest however; reduced budgets for recreation and law enforcement will impair the agency's ability to monitor, maintain, and mitigate these impacts from OHV's.

Cattle grazing will continue at existing levels and seasons of use based on a recent National Environmental Policy Act decision for the Aladdin Complex Grazing Environmental Assessment. This will affect all parts of the analysis area except the Rocky Creek subwatershed whose allotment is vacant. Water quality is expected to remain at existing levels on streams within the analysis area used for grazing over the next 10-15 years. No changes to the state 303(d) list are anticipated for these streams during this time. Cattle will eventually lose transitory range as older regeneration harvest units recover hydrologically. This is expected to increase grazing pressure along roads, homestead meadows, streams, and wetlands. This may eventually result in impaired conditions for water quality and riparian conditions. The areas most likely to be affected are the wetlands downstream of the Big Meadow Lake dam and at the junction of Meadow Creek County Road #2695 and FR #255. Several riparian areas (including these two) were identified for monitoring by the Forest Service and the cattle permittee in the Aladdin Complex Grazing EA. Annual operating plans for these allotments can be adjusted if water quality and/or riparian conditions fall below forest plan standards.

Chronic sedimentation from roads is expected to affect water resources for many years. Sediment delivery to area streams will decrease slightly as roads are closed through management decisions and vegetation becomes reestablished. Stream temperatures and fecal coliform bacteria levels are not expected to change appreciably. Currently none of the streams in the analysis area are on the state 303(d) list. Area streams will likely continue to meet state water quality criteria in this scenario of Alternative A.

Water Yield & Channel Morphology

No new roads and no new stream crossings will be constructed on federal lands under this alternative. This will eventually result in a net decrease of management related sediment as vegetation encroaches and roads recover hydrologically. However, there will be no opportunities to improve impaired riparian road locations, surfacing, or drainage structures under a timber sale contract. Existing riparian roads will continue to introduce sediment levels resulting in delivery of fines, downstream deposition on lower gradient stream reaches, higher width-depth ratios, and embeddedness of spawning gravels. Stream crossing culverts that currently restrict or prohibit fish passage will remain as barriers.

Increased vegetation densities will restrict cattle and recreational access to riparian areas. Favorite haunts of both cattle and people will continue to be maintained in areas popular for camping and foraging. This will result in continued downstream sedimentation and increased width/depth ratios at crossing points. Many old harvest areas and road locations will eventually grow closed naturally and use patterns will decrease or cease. Stream banks and road crossings in these areas will stabilize and recover as vegetation reestablishes itself. Isolated slope failures will occur along former road templates as they continue to intercept subsurface flows, ditch lines become impeded, and cut/fill slope failures occur. These may or may not deliver sediment to stream channels depending on their location.

Created openings will decrease in size over the next 25-30 years until these watersheds recover hydrologically. If timber harvest does not control stand densities most areas will eventually become overstocked. Overstocked stands will increase evapotranspiration rates and may decrease streamflows. Aquatic resources will be affected by low flows during the late summer and fall. Higher fuel loads will also increase the risk of uncontrolled fires.

Floodplains, Wetlands, and Groundwater

Floodplains and wetlands will continue to be directly and indirectly affected by the existing road system, developed and dispersed recreation, cattle grazing, and the ongoing effect of old timber harvest units. Sediment and fecal coliform bacteria will continue to affect water quality in these areas although they are expected to continue to meet state water quality standards. Water temperatures are likely to remain unaffected or decrease slightly from current levels. Natural storm and spring runoff events will increase peak flows, however channels will remain stable and floodplains will revegetate and stabilize naturally between these events. Floodplains along the mainstem of the South Fork will remain accessible to cattle and therefore susceptible to hoof trampling, compaction, and erosion.

Localized streamflows may have increased over reference conditions due to roads and soil compaction in old harvest units. These increases are expected to be small and will be masked by seasonal variations in flow. Streamflows in other areas of the watershed have probably decreased over reference conditions as a result of increased evapotranspiration rates from over-stocked stand conditions. Groundwater function is not expected to change appreciably in the next 5 to 10 years. Vegetative ingrowth over the long-term may continue to increase evapotranspiration rates and eventually result in reduced groundwater flows.

Cumulative Effects

Water Quality

The cumulative effects to water quality are anticipated to be similar to those described in the direct/indirect effects section of Alternative A. Water temperatures and fecal coliform bacteria levels may decrease slightly in the headwaters of analysis area streams on federal lands due to increases in riparian vegetation. Cattle grazing will continue on permitted allotments within the analysis areas and on private lands. Riparian vegetation has been cleared for timber harvest and agriculture, effective shade reduced, and cattle access to streams and wetlands increased on private lands along the mainstem. The net change throughout the analysis for temperature and fecals is expected to be small and within existing levels of variation.

Without timber harvest on federal lands, roads will remain the primary source of sediment delivery to streams in the analysis area. The transportation system in the analysis area will continue to be used under the No Action Alternative for timber harvest on state and private lands, recreation, resource administration (such as grazing permits), and fire access. Chart 4-1 displays the results of the continued use of analysis area roads for these purposes. Road maintenance is expected to continue at existing levels on county roads and decrease on Forest Service roads. Road-related sediment will continue to be delivered to streams at crossings from adjacent road segments. The sediment model indicates that existing roads are contributing 28% of the calculated total sediment budget within the South Deep area. A higher proportion of road sediment is coming from the Rocky and Meadow Creek drainages (36% and 30% respectively) whereas 80% of the sediment coming from the South Deep Tribs is natural background sediment and 20% is derived from roads. This difference is due to more riparian roads in the Rocky and Meadow Creek drainages and slightly fewer crossings in the South Deep Tribs. The model also indicates that a fairly high proportion of the road related sediment is originating on non-federal roads: Meadow Creek—52%, South Deep Tribs—34%, and Rocky Creek—46%. These results seem reasonable based on field observations during and after storm events and spring runoff in these watersheds.

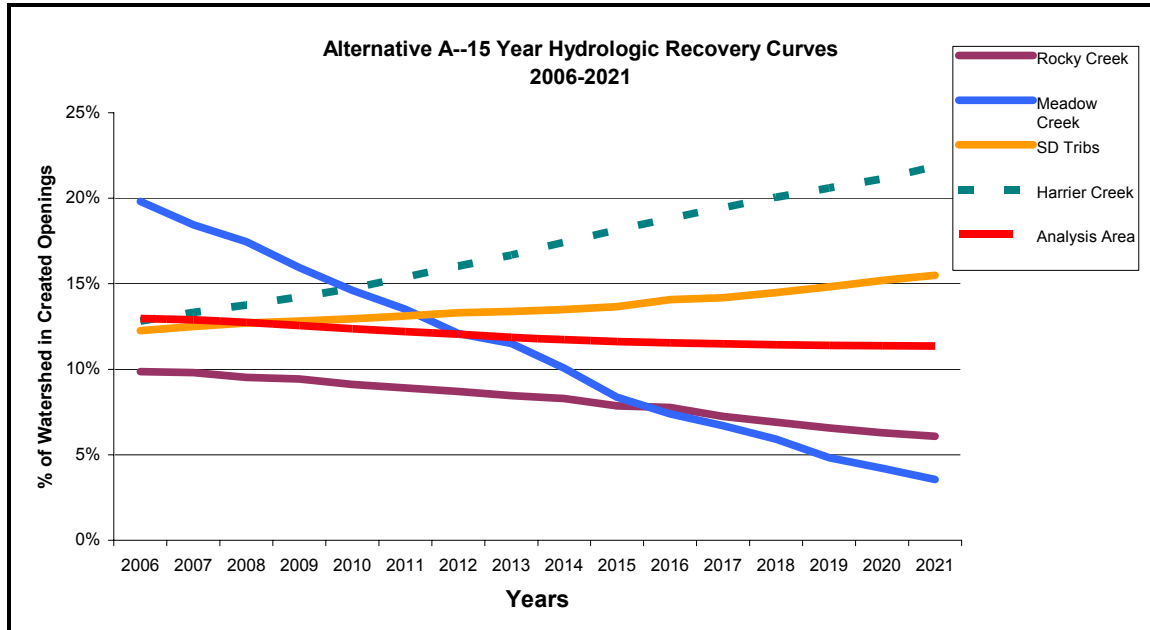
Sediment (both natural and road-related) will move downstream and outside the project area during spring runoff and/or large storm events. The sediment transported through these stream systems is deposited downstream in low gradient reaches along the mainstem of the South Fork, Deep Creek, or eventually in Lake Roosevelt. Turbidities will exceed state water quality standards for short time periods during and immediately after these events. Normally streams clear up within a few hours or days after the event is over. Lower levels of Forest Service road maintenance in the future will result in an increase in roadside vegetation and some road segments will close themselves naturally as vegetation reclaims these areas. Decreases in sediment delivery from these areas may be offset at locations where lack (or decreased levels) of road maintenance results in culvert failures, cutslope slumps, and impeded ditch lines that increase sediment delivery to streams and wetlands. Some of this increase can be mitigated through the installation of proper drainage structures and closure devices as roads are decommissioned. Long-term management related sedimentation from these headwater areas is expected to decrease long-term as these areas stabilize. This stabilization will take many years especially as it relates to roads since they normally retain their hydrologic characteristics over long periods of time due to compaction.

Project area streams are expected to continue to meet state water quality standards. The mainstem of the South Fork is expected to remain on the state 303(d) list for temperature due to lack of riparian vegetation outside the forest boundary.

Water Yield and Channel Morphology

The results of the equivalent clearcut area model shown in Chart 4-1 include an estimate of future harvest levels on state and private lands based on State Forest Practices applications over the past four years. It is unknown if such recent harvest levels (approximately 1,200 acres/year) on private lands are sustainable into the future.

Chart 4-1



Future equivalent clearcut areas within the project area are expected to improve slowly over existing levels as old regeneration harvest units recover hydrologically. The amount of regeneration harvesting on this national forest decreased greatly after the early 1990's. Harvest prescriptions used by the Forest Service today remove less trees/unit area than in the past and therefore have less effect on the equivalent clearcut area model and the hydrologic recovery of the watershed. This shift will become more evident in another 10-15 years as the last of the old regeneration units completely recover in many of these watersheds.

Under Alternative A stream flows would not change substantially over existing levels within the analysis area during the next 10-15 years. Vegetation on federal lands in these subwatersheds will continue to recover hydrologically. Some subwatersheds (such as Meadow Creek) will recover faster than others because they contain older harvest units that are on the steeper portion of the recovery curve. Based on recent Forest Practices Applications, for purposes of the Equivalent Clearcut Acreage model, it is assumed that logging will continue on state and private ownerships in all subwatersheds of the analysis area. Chart 4-1 shows that the Equivalent Clearcut Acreage recovery curves for Harrier Creek and the South Deep Tribs continues to increase due to continued logging on state and private land. The equivalent clearcut areas for both Harrier Creek and the South Deep Tribs will remain below the 25% threshold of concerns during the next fifteen years. If logging on non-federal lands does continue as projected the increases in water yield will be confined to the lower elevation areas and the mainstem of the South Fork outside the forest boundary. Hydrologic recovery is expected to continue in the headwaters and no increased channel-forming flows from federal lands are expected to cumulatively contribute to degraded channel conditions along the mainstem of the South Fork. The recovery curves for Rocky Creek and Meadow Creek will continue to decrease even though logging of state and private lands is expected to continue. These subwatersheds will continue to recover hydrologically due to the large proportion of each subwatershed in federal ownership. With continued logging on state and private lands, the combined equivalent clearcut areas for all subwatersheds in the analysis area decreases slightly over

the next 15 years. No detrimental, channel-forming flows are expected to occur within the analysis area as a result of this scenario.

Since no new harvest units would be implemented on Forest Service ownership, the risk of rain-on-snow events and flooding would decrease over time as crown closure and basal area of existing stands increase. However, most Forest Service ownership is located above the rain-on-snow zone and the risk of such events is low. Most private lands are located at lower elevations within the rain-on-snow zone. Continued logging on private ownerships within South Deep will reduce stand densities, canopy cover, and snow interception. Continued timber harvest in these areas will increase the susceptibility of these low elevation zones to future rain-on-snow events.

Floodplains, Wetlands, and Groundwater

Any downstream cumulative effects resulting from the No Action Alternative are expected to be small, undetectable, and within the natural range of variability for these areas. Such effects may include small decreases in water temperatures, fecal coliform bacteria, and sedimentation.

Effects Common to Alternatives E and G

Direct and Indirect Effects

The potential impacts to water resources that are common to these action alternatives have similar effects, but differ in terms of scale and magnitude based on the amount of treatment area proposed for each activity. For instance, the alternative that proposes the most timber harvest and builds the most roads (Alternative G) will have the greatest probability of effecting stream sedimentation because it creates the most soil disturbance.

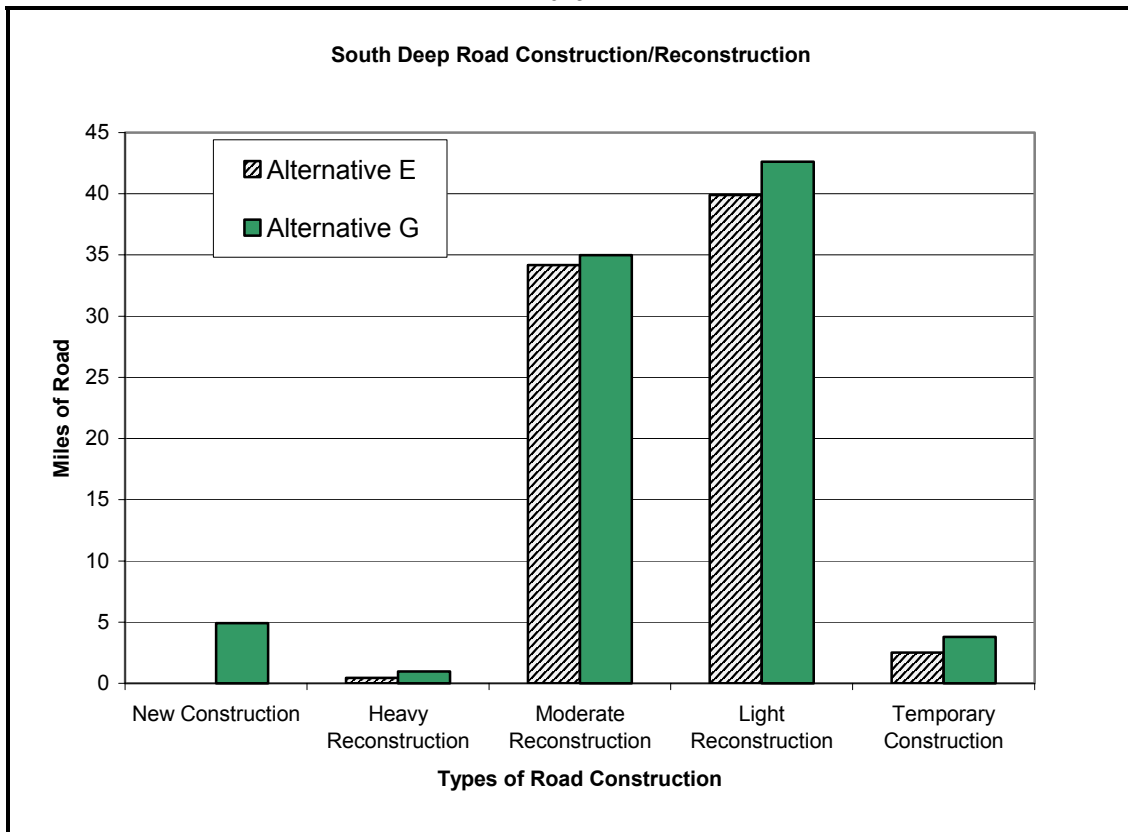
Water Quality

Based on field observations and currently listed 303(d) streams on this forest, three water quality parameters have the highest probability of being affected by the activities proposed in Alternatives E and G--sedimentation, stream temperature, and fecal coliform bacteria.

Sedimentation--Erosion and the subsequent delivery of soil particles to streams and wetlands will be the primary effect to water quality resulting from timber harvest, road construction, and prescribed burning under both action alternatives. Ground based logging systems generate more skid trails and landings than the other forms of yarding used to harvest timber. This usually results in a greater degree of compacted soils, lower infiltration rates, and higher erosion rates than areas harvested with other yarding methods. Based on the results of field observations, Inland Native Fish Strategy buffers are adequately mitigating the effects of timber harvest and prescribed burning on other areas of the district.

The only areas where we would expect direct and indirect sediment delivery to streams is where harvest units, road prisms, and burn units extend inside Inland Native Fish Strategy riparian buffers. Since no timber harvest or prescribing burning is proposed in the riparian zones of either Alternative E or G, roads will be the primary source of sedimentation considered to contribute to area streams.

Chart 4-2



Alternative G will construct or reconstruct the most miles of road (about 10 miles more than Alternative E). This activity is distributed fairly evenly across all road construction categories. (See Chart 4-2) The affected road segments located within Riparian Habitat Conservation Area's will exert the greatest influence on sedimentation. This corresponds with the results of the sediment model.

Road sediments are most likely to enter streams at locations where the road crosses the stream. Sedimentation can also occur where riparian roads are located adjacent to streams. Some of these road impacts can be mitigated (i.e. through the timing of construction activities and the installation of devices to intercept eroded sediments before they reach the stream channel).

Most of the sediment produced from these riparian road activities will consist of gravel, sand, and silt-sized particles in the suspended and bedload of the streams. Bedload sediments will be deposited in the low gradient, downstream reaches of these watersheds. Filling of sediment traps behind large woody debris will be the most visible changes to channel morphology. These are expected to occur during the recession leg of the spring snowmelt hydrograph in June and July. Stream turbidities from suspended sediments will increase during and immediately after riparian road construction/reconstruction. Turbidities are expected to decrease as soon as these activities are complete. Mitigation measures (i.e. stream diversion) during construction activities can usually maintain turbidity levels within state water quality standards. Turbidity levels will be elevated at and immediately downstream from road crossings undergoing new and heavy reconstruction. State water quality standards "allow for temporary areas of mixing during and immediately after necessary in-water construction activities that result in the disturbance of in-place sediments. This temporary area of mixing ...can occur only after the implementation of appropriate best management practices." (WAC 173-201A, p 11) Current road mitigations are usually effective in maintaining water quality standards.

Direct and indirect bedload sedimentation from riparian road construction, reconstruction, and maintenance, is expected to be of short duration (3-5 years). Most of these sediments will be flushed downstream during spring peak flows. Sediments will continue to move through the system during spring

runoff and large storm events. When vegetation becomes reestablished along these travel corridors, sediment levels will drop to a new baseline level. Mitigation measures are expected to be partially effective in offsetting these impacts. (See Best Management Practices for effectiveness)

Most of the stream crossing activities under both action alternatives will consist of light and moderate reconstruction. Alternative E will not construct any new stream crossings. Alternative G will construct 2 new crossings—both in the South Deep Tribs. Both crossings are on Class IV (intermittent) streams. The reconstruction of many of these stream crossings will result in a decrease in existing sediment levels since crossing reconstruction will include aggregate surfacing on the road surface. These gains will be more than offset by the increased sedimentation from subsequent log haul traffic. Alternative E will include heavy reconstruction of 2 existing crossings, both in the headwaters of Rocky Creek. Alternative G will include heavy reconstruction on four crossings. Two of these will be in the headwaters of Rocky Creek, one in the headwaters of Scott Creek, and one in the headwaters of the South Fork of Rogers Creek. The heavy reconstruction and newly constructed crossing locations have the greatest potential to deliver sediment to downstream reaches.

One of the crossings scheduled for heavy reconstruction in Rocky Creek (FR #7018.000) under both alternatives has been a chronic problem in the past. This culvert has plugged and the road has washed out several times at this location. No feasible options have been found to relocate the road at this crossing due to topographic restrictions. Reconstruction will definitely improve the existing situation at this site; however the heavy reconstruction of this crossing (including culvert replacement) will not be implemented concurrently with the timber sale.

Chart 4-3

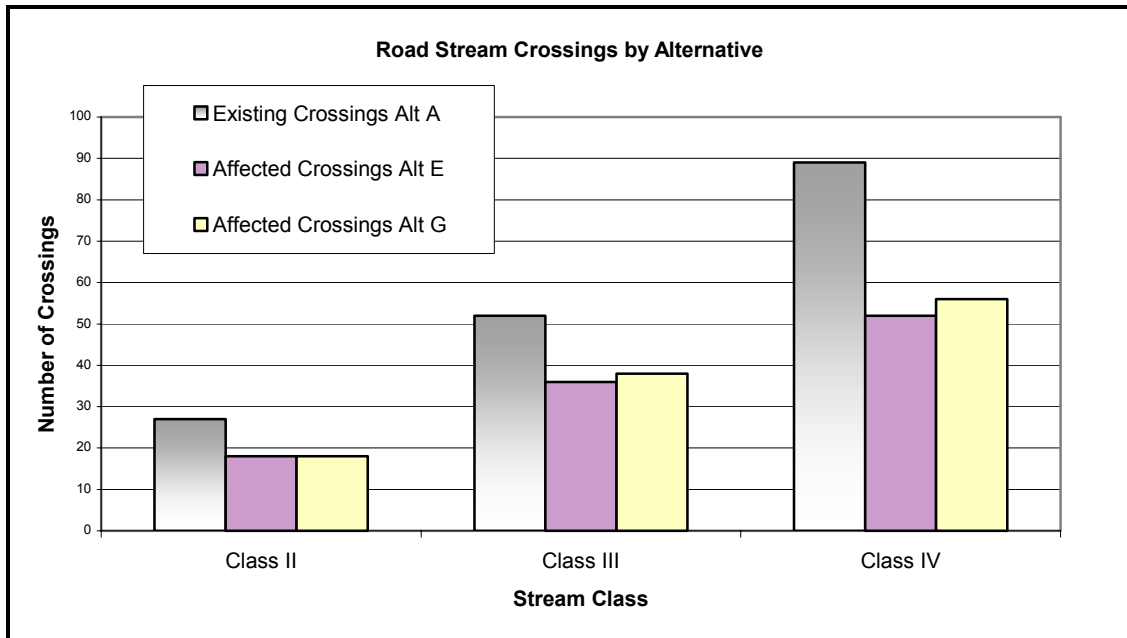


Chart 4-3 displays the total number of existing crossings and the affected stream crossings by stream class in each action alternative and compares it against the total number of existing crossings in the project area. Affected crossings are those crossings scheduled for construction, reconstruction, or haul under the action alternatives. Alternative G will use slightly more stream crossings than Alternative E since it proposes more road reconstruction and 2 new crossings. Most of the affected crossings in both alternatives are on Class IV (intermittent) streams. Mitigation measures that restrict construction/reconstruction activities to periods of no flow are very effective and little sediment delivery usually occurs at these intermittent locations. Mitigation measures on Class III (non-fish bearing) and Class II (fish bearing) streams is somewhat less effective and more difficult due to their perennial flows.

Chart 4-4

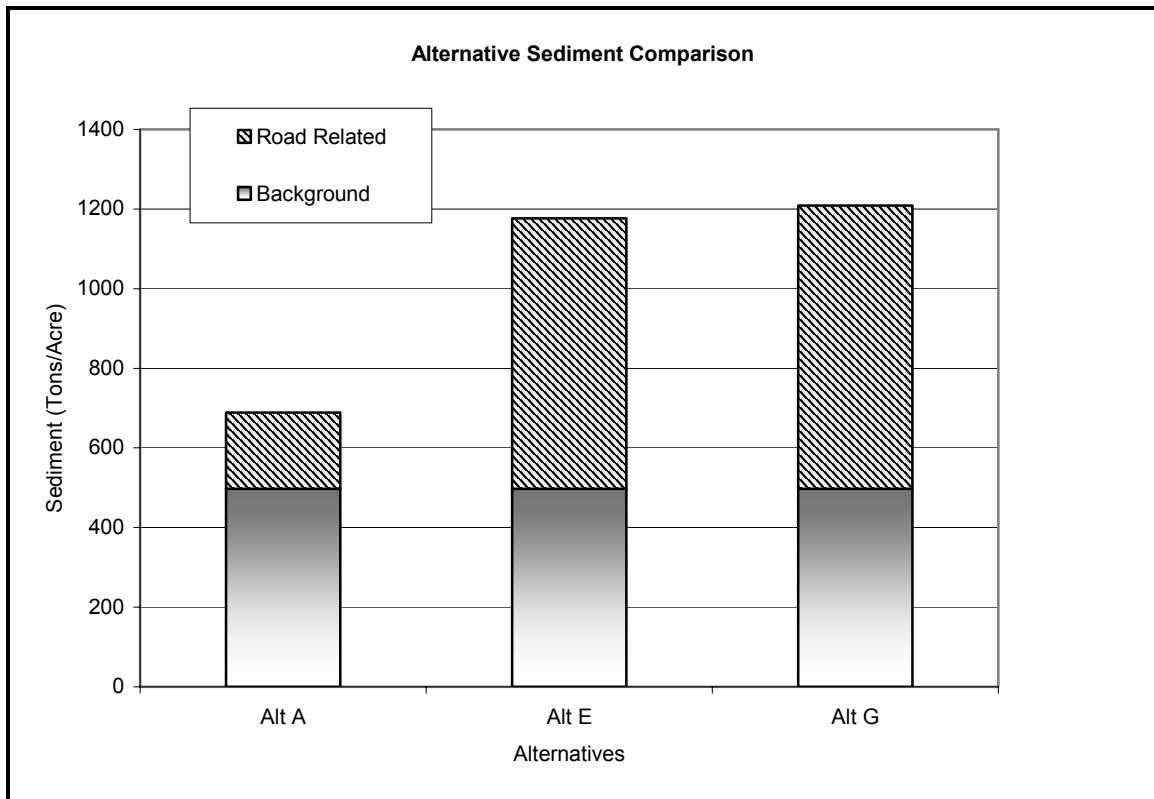


Chart 4-4 displays the results of the sediment model for the project area. Total sediment production from both natural background levels and road related sources will approximately double under both action alternatives compared to the existing condition (Alternative A). Alternative G will produce slightly more sediment than Alternative E due to construction of 2 new crossings and the use of more roads for haul. These effects are not considered significant since the impacts will be further reduced through Best Management Practices. The model does not consider all Best Management Practices and is therefore a worst-case scenario. These effects are only expected to last for a few years (during project implementation) before returning to new baseline sediment levels. It is not possible to say what the new baseline level will be but it could be an improvement (reduction) over existing sediment levels due to improvements at stream crossings, road decommissioning, etc.

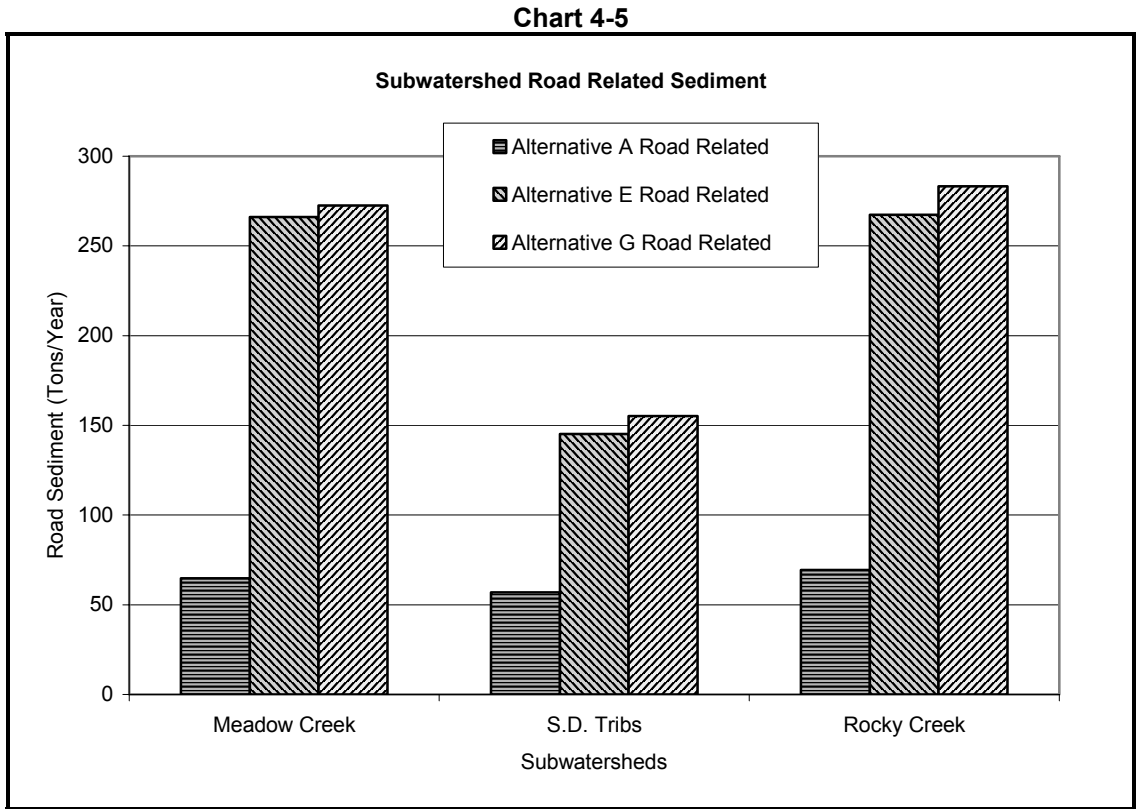


Chart 4-5 displays the road related results of the sediment model by subwatershed. The background levels are not displayed in this chart. Alternative A is included in the chart for purposes of comparison with the two action alternatives. Modeled sediment production is highest in the Rocky Creek and Meadow Creek subwatersheds. These effects are not considered significant since the impacts will be further reduced through Best Management Practices. The model does not consider all Best Management Practices and is therefore a worst-case scenario. These effects are only expected to last for a few years (during project implementation) before returning to new baseline sediment levels. It is not possible to say what the new baseline level will be, but it could be an improvement (reduction) over existing sediment levels due to improvements at stream crossings, road decommissioning, etc. These two subwatersheds have more miles of riparian road and stream crossings than the South Deep Tribs.

Both action alternatives will remove approximately six and a half miles of forest roads from the forest transportation system. This includes six existing road/stream crossings on four road segments. Some of this will be a paper exercise since many of these roads have already grown closed with vegetation or have restricted access across private property. Of the six crossings identified for removal only three of them will actually be removed. The others have already been removed or are inaccessible to machinery. The direct and indirect effects for these actions will be the same as those previously described for new and reconstructed crossings. All roads proposed for closure that are still accessible to machinery should be drained, ripped, and seeded. In addition, the following will be implemented:

FR #7005.790 has been closed with a slump deposit and the stream crossing culvert is partially blocked with debris. The culvert would be removed at this location and the original channel configuration restored. The road in the area of the slump deposit would be obliterated and the original slope configuration restored. This would constitute the road closure.

FR #7020.500 used to cross Rocky Creek and provide access to the headwaters of Polley Creek. No structures currently exist at the Rocky Creek crossing and much of the road has grown closed. No field work is necessary before removing this road segment from the permanent transportation system.

FR #7020.775 contains two culverts on Kenny Creek on the road segment proposed to be abandoned. These culverts would be removed and the original channel configuration restored.

These restoration measures will improve hydrologic stream function and remove the risk of future road fill failures. Ripping will break up soil compaction and increase infiltration rates and improve groundwater function. Seeding will stabilize disturbed soils faster than natural regeneration from surrounding vegetation. The Colville National Forest Guide to Seeding and Planting Vegetation will provide guidance for all site restoration. Complete hydrologic recovery of these decommissioned roads will take many years since soil compaction lasts for decades. The effects of these road restoration activities will be small and undetectable at the watershed and subwatershed scale.

No riparian logging or prescribed fire is proposed within riparian habitat conservation areas and therefore cattle are not anticipated to affect water quality as a direct or indirect result of these activities. Road construction will create 2 new stream crossings in Alternative G. Only one of these new crossings in Alternative G is in an active grazing allotment that could result in increased cattle access and affect water quality. Some impacts at this crossing can be mitigated through slash fences, drift fences, or off-site water developments. This may discourage continued cattle use at this crossing after the road is closed. Kenny Creek is intermittent at this location during normal water years and therefore sediment impacts will be reduced during much of the grazing season. These mitigations should only be implemented if monitoring shows that adverse impacts are occurring. Cattle do not currently frequent this area due to poor access. One new stream crossing within a cattle allotment is not likely to result in measurable changes in water quality parameters. No new stream crossings will be created in Alternative E; therefore water quality due to the influence of cattle is expected to remain at existing levels in this alternative. Streams are anticipated to continue to meet state water quality standards for turbidity under both action alternatives.

Stream Temperature--Road construction/reconstruction will be the only source of temperature changes to area streams. Road corridors are narrow and the openings created at these locations will have minimal effect on riparian shade. Alternative E has no new stream crossings and temperatures are anticipated to remain at existing levels. Alternative G will create two new stream crossings. The small area affected by new crossing is not large enough to create a measurable increase in stream temperatures attributable to management activities. Streams are anticipated to continue to meet state water quality standards for temperature on federal lands within the project area under both action alternatives.

Proposed road decommissioning will result in a return to natural vegetative shade conditions at six existing stream crossings. Three of these sites (Meadow Creek and Rocky Creek) have either already had the crossing structures removed or are inaccessible to machinery. Three crossing sites on Kenny Creek and Thomas Mountain will be restored in conjunction with this project. Recovery at all of these sites will take many years before full shade is restored. None of the streams on federal lands are on the state 303(d) list for temperatures. This is not anticipated to change as a result of proposed closures since overstory riparian vegetation will not be affected. Downstream temperatures may decrease slightly as vegetation becomes reestablished at these decommissioned crossings; however these changes will be small and undetectable at the watershed scale. The mainstem of the South Fork will probably continue to exceed state water quality standards for temperatures due to the lack of effective shade.

Fecal Coliform Bacteria--New road segments, timber harvest, and fuels treatments on gentle slopes close to streams may increase cattle access into riparian areas. Cattle are attracted to these areas because of easy access to water, shade, and forage. Increased access by cattle may increase bacteria levels and affect water quality. No timber harvest or prescribed fire is proposed within the riparian habitat conservation area's of either Alternative E or G. Alternative E will not create any new stream crossings and will not affect fecal coliform levels. Alternative G will create one new road/stream crossing within an active cattle allotment. It is, therefore, unlikely that measurable changes will occur in levels of fecal coliform bacteria due to cattle. The same mitigations in the sedimentation section above will also reduce the cattle impacts that may affect fecals. Water quality is anticipated to continue to meet state standards for fecal coliform bacteria on federal lands under both action alternatives. Several harvest units are located on flat open ground surrounding the wetlands below Big Meadow Lake. A riparian fence around these wetlands has been discontinued. Water quality and riparian vegetation monitoring should continue at this site to insure that riparian habitat conservation areas widths are providing adequate riparian buffers.

Water Yield and Channel Morphology Effects

Some changes in channel morphology can occur as a result increased sedimentation from new road/stream crossings. However; Alternative E will not build any new crossings and Alternative G will build two. With a total of 168 crossings already existing in the project area, this represents a 1% increase in stream crossings at the watershed scale. Best management practices for roads will mitigate some of these effects. Direct and indirect changes in channel morphology are likely to remain within the existing range of variation and will not be detectable using standard monitoring techniques. Project road improvements may result in a net decrease in management related long-term sedimentation; however the sediment model only projects the results for three years. Timber sale activities will still be ongoing at the end of this time and the long-term results from the model are unknown. Long-term sediment recovery will occur after project completion (probably 3-5 years) as disturbed soils are stabilized by vegetation and as traffic returns to pre-project levels. Many of these sediments will be flushed down stream every spring during snowmelt runoff.

No changes in channel morphology are anticipated to occur from timber harvest or fuels treatments since these activities are not proposed within riparian areas. Inland Native Fish Strategy riparian habitat conservation areas are expected to mitigate any direct and indirect effects of management activities (other than roads) on aquatic resources.

Stream channels and flows in the analysis area have adjusted to management related created openings (i.e. homestead meadows and road corridors) since many of them have been in place for 60 to 80 years or more. Existing stream channels in South Deep probably formed under historic reference conditions that included higher base flows due to more open stands conditions and lower evapotranspiration rates. Proposed treatments under both Alternatives E and G are not anticipated to increase flows beyond those historically encountered in these watersheds.

Road decommissioning will partially restore natural hydrologic processes at small localized locations through deep ripping and planting in both action alternatives. The recovery of these areas will continue over long periods of time as soils stabilize and vegetation becomes reestablished. The effects will be undetectable using current monitoring techniques since the affected areas are small in relation to the size of the project area.

Floodplains, Wetlands, and Groundwater

Past activities have had an effect on wetlands and floodplains. Impacts have been primarily related to historic logging, and road construction in riparian areas. There has also been some effect to wetlands by cattle grazing in the headwaters of the project area. These previous activities have resulted in bank trampling, sedimentation, soil compaction, and the introduction of fecal coliform bacteria to area waters. Most of the areas affected by cattle are small and scattered throughout the South Deep Tribs and the Meadow Creek subwatershed. No cattle are allowed to graze on federal lands within the Rocky Creek subwatershed. Some old roads and harvest units have impacted riparian areas by constricting streams and floodplains and by removal of riparian vegetation. Some existing roads, especially in lower slope locations, intercept and channel groundwater flows.

The potential direct and indirect effects to wetlands, floodplains, and groundwater are similar to those already described above for water quality and water yield. Groundwater flows may be intercepted by new road construction (especially on lower slope locations) and diverted into active stream channels if ditch lines are located within the contributing areas of the streams. The additional area affected by new road-cutslope interception is not anticipated to be large enough to result in increased peak streamflows under any action alternative. Slopes and vegetation below these intercept points may become somewhat drier. Groundwater interception normally only occurs within a few of feet of the surface, leaving deeper subsurface flows intact. Affected downslope vegetation is not anticipated to change since soil moistures normally fluctuate throughout the growing season and most plant communities occupying these sites have adapted to such seasonal changes. Detectable levels of groundwater function are not expected to change within the watershed because of the short-term, localized nature of these activities. Some of the floodplains and wetlands may be affected by prescribed fire, but effects should be minimal. The sedimentation is expected to be insignificant due to Inland Native Fish Strategy riparian buffers and low

intensity burns. No prescribed fire ignition will be allowed within riparian zones; however low intensity fires originating from upslope burn treatments may occasionally back down into riparian habitat conservation areas. Most riparian habitat conservation areas within the analysis area have experienced natural fires in the past, and if prescribed fires burn into riparian areas they will likely be low intensity fires that primarily affect understory vegetation. Mortality in the overstory vegetation >10 inches diameter at breast height is expected to be low (<10%) and it will continue to provide bank stability and effective shade.

Several domestic water sources in lower Rocky Creek serve homes in that area. The closest proposed units are approximately ¼ mile upslope from these water sources. Timber removal will increase groundwater flows to these downslope areas as long as soil compaction remains within forest standards. These concerns can be mitigated through harvesting of adjacent upslope units SDA and SDB to insure compliance with detrimental soil standards (see Best Management Practices).

Cumulative Effects

Cumulative effects include those occurring on other ownerships within the watershed as well as Forest Service management activities. A cumulative effects assessment is required for all watersheds where project scoping identifies an issue or concern regarding cumulative effects. This report will consider the assessment of the current watershed condition and add the effects of proposed future activities on both federal and non-federal ownerships.

The past and present hydrologic condition of the South Deep watershed has been determined from data in the Interim Activity Database, the district GIS activity layer, aerial photo interpretation, the BLM planning website, and the Forest Practices Database maintained by Washington State Department of Natural Resources. These past and present actions were added to the reasonably foreseeable future actions on all ownerships in the watershed to determine the possible cumulative effects to water resources.

The hydrologic (watershed) boundaries will be used to evaluate the cumulative effects of this project since these boundaries determine the majority of the surface and groundwater flow patterns within the analysis area.

The water yield cumulative effects analysis for the South Deep project will consider actions that have occurred within the analysis area during the last 30 years since hydrologic recovery on the Colville National Forest is assumed to be complete after that time period. The cumulative effect of future actions on water yield will be analyzed for the next 15 years. Assumptions were made regarding future harvest levels for state and private lands within the watershed since forest practices applications with the state are only valid for 2 years from the time of application. An average annual non-federal harvest level was used in the Equivalent Clearcut Acreage calculation for each subwatershed based on the previous to five years of forest practices applications. It is not known how closely the forest practice applications correspond to actual harvest levels, nor is it known if these current harvest levels are sustainable in the future. These non-federal harvest levels were used for calculating equivalent clearcut areas since logging will probably continue on non-federal lands within the watershed irrespective of federal actions. This assumption was also used for the No Action alternative (A) even though no activities were assumed to occur on federal lands that would result in created openings. This is why the Harrier Creek subwatershed continues to show an increasing Equivalent Clearcut Acreage value over the next fifteen years under the No Action Alternative.

Areas that will be treated for fuels and Wildland Urban Interface objectives are located both inside and outside of proposed commercial harvest units. The cumulative effects of fire treatments inside commercial units were analyzed with the effects of commercial timber harvest. Shaded fuel breaks were not included in the cumulative effects analysis since the material scheduled for removal is small (less than 7 inches in diameter at breast height) and the overstory will remain functional for snow intercept and evapotranspiration. The effects should be similar to a light thinning from below.

Tree mortality in units treated with prescribed fire is expected to be less than 10% for trees more than 10 inches in diameter at breast height and less than 25% for trees between 8 and 10 inches diameter at breast height. The cumulative Equivalent Clearcut Acreage effects are modeled in these areas using a

mortality estimate of 35%. This probably overestimates the effects and should be considered a worst case scenario.

Based on discussions with the Silviculturist the proposed post and pole units in Rocky Creek will remove <30% of the basal area in these stands. These units were not included in the cumulative effects Equivalent Clearcut Acreage model. The model is designed to treat stands with <30% basal area removal as having no effect on the amount of created openings in the hydrologic recovery of these watersheds.

Rock pits and decommissioned roads are not included in the Equivalent Clearcut Acreage model since the areas affected are small and will not be significant at the watershed scale. Many of the decommissioned roads are already growing closed and are already contributing to the hydrologic recovery of these watersheds.

Water Quality

Sedimentation--Much of the projected sediment increase under both action alternatives will be directly related to log haul and road construction/reconstruction. The most visible increase will be small particles carried in suspension. These are particles will remain in suspension during high and moderate flow velocities and will not settle out downstream until reaching slack water in low gradient reaches or behind large woody debris. These particles can contribute to increased downstream turbidity levels. Increased turbidities typically occur during snowmelt runoff in the spring or during large storm events even under natural conditions. Road construction, reconstruction, and maintenance during timber sale operations will also contribute coarser sediments in the range of sand and medium-sized gravel. Some of these larger particles would add to the existing levels of bedload transport and decrease downstream storage capabilities. The amount of increased short term turbidity from proposed management related sources will be negligible by the time it reaches the mainstem of the South Fork. Bedload sediments will be trapped behind large in-stream woody debris and deposited along bars on lower gradient stream reaches of the mainstem of the South Fork. Most bedload movement will occur during spring runoff and large storm events.

Based on past history, it is reasonable to assume that Level 1 road closures will continue to be breeched by full-sized vehicles and OHV's. This will result in rutting of the travel way and limit the effectiveness of road drainage structures. Runoff from these road surfaces will continue to cause surface erosion (sheet, rill, and gully) and sediment transport to adjacent stream channels. These effects are expected to be small and undetectable using current monitoring techniques, but they will contribute to sediment loading in the project area from these sources.

Off-site cumulative effects of sedimentation are not anticipated to occur from proposed road construction/reconstruction point sources due to their small size and scattered locations. Most road crossings will not be constructed or reconstructed simultaneously with other sites in the same watershed. Normally any elevated downstream turbidity levels from one site will have cleared before work begins at another site in the same subwatershed.

Existing management-related sediments will continue to move through the South Deep analysis area and into downstream reaches of Deep Creek eventually reaching the Columbia River. Downstream effects outside the project area are likely to remain within the existing range of variation and/or be masked by other activities occurring at lower elevations on state and private lands in the South Deep watershed as well as in other parts of the greater Deep Creek watershed. The 2280 acre Black Canyon fire (2003), located in the lower Deep Creek watershed, has probably increased sediment levels in Deep Creek below the South Deep analysis area. The extent of these impacts is unknown since this area is outside the forest boundary and no surveys were conducted in this area. The implementation of standard best management practices should effectively mitigate most of the downstream and cumulative effects of proposed federal actions within the project area. Stream turbidities are expected to meet state water quality turbidity standards under both action alternatives.

The effects of timber harvest are expected to be slight (virtually undetectable downstream) since riparian harvest and fire treatments are not scheduled within Inland Native Fish Strategy riparian habitat conservation areas in either action alternative. Prescribed burning and the use of fire for natural fuels reduction and wildlife habitat improvement in the past have not created ground disturbance nor caused

increased erosion except in small, localized areas of concentrated fuels. Continued use of fire for this purpose is not anticipated to increase sediment delivery to streams in the project area. Any surface erosion from these areas will be adequately buffered by vegetation in undisturbed riparian habitat conservation areas prior to reaching the streams and no downstream cumulative effects are anticipated from proposed vegetative treatments in either action alternative.

No downstream cumulative effects from road related sediments are anticipated to occur from road abandonment/obliteration activities due to the small scale and scattered site locations. Any additional sediment delivered to area streams resulting from these activities will result in slightly increased turbidities over short periods of time (a few hours to a few days). Long term hydrologic function will improve slightly as vegetation and soils recover.

Temperature—No downstream cumulative effects to stream temperatures are anticipated to occur under either action alternative since Inland Native Fish Strategy riparian habitat conservation areas will remain intact and undisturbed. Alternative E will not construct any new stream crossing and will use only existing stream crossings. Alternative G will construct two road/stream crossings in addition to existing crossings. Downstream cumulative effects to temperature will be minimal and undetectable using standard monitoring techniques. Stream temperatures along the mainstem of the South Fork will likely continue to exceed state water quality standards because of the lack of overstory riparian vegetation along those stream reaches.

Fecal Coliform Bacteria—No downstream cumulative effects to fecal coliform bacteria are anticipated to occur under either action alternative since Inland Native Fish Strategy riparian habitat conservation areas will remain intact and continue to limit cattle access to streams and wetlands. Streams on federal lands are anticipated to continue to meet state water quality standards for fecal coliform bacteria within the South Deep watershed. Cattle have more access to streams in low elevation pastures of the watershed due to a lack of riparian vegetation; however these reaches currently meet state standards for fecals and likely will in the future unless substantial changes to land management practices occur outside the project area.

Water Yield and Channel Morphology

Under both Alternatives E and G, timber harvest, road construction, and non-commercial treatments will increase created openings across the project area. The probability of peak flows causing stream channel damage increases as the harvested area of a watershed exceeds 25% in an open condition. (Colville National Forest Plan FEIS, p. IV-17)

Chart 4-6

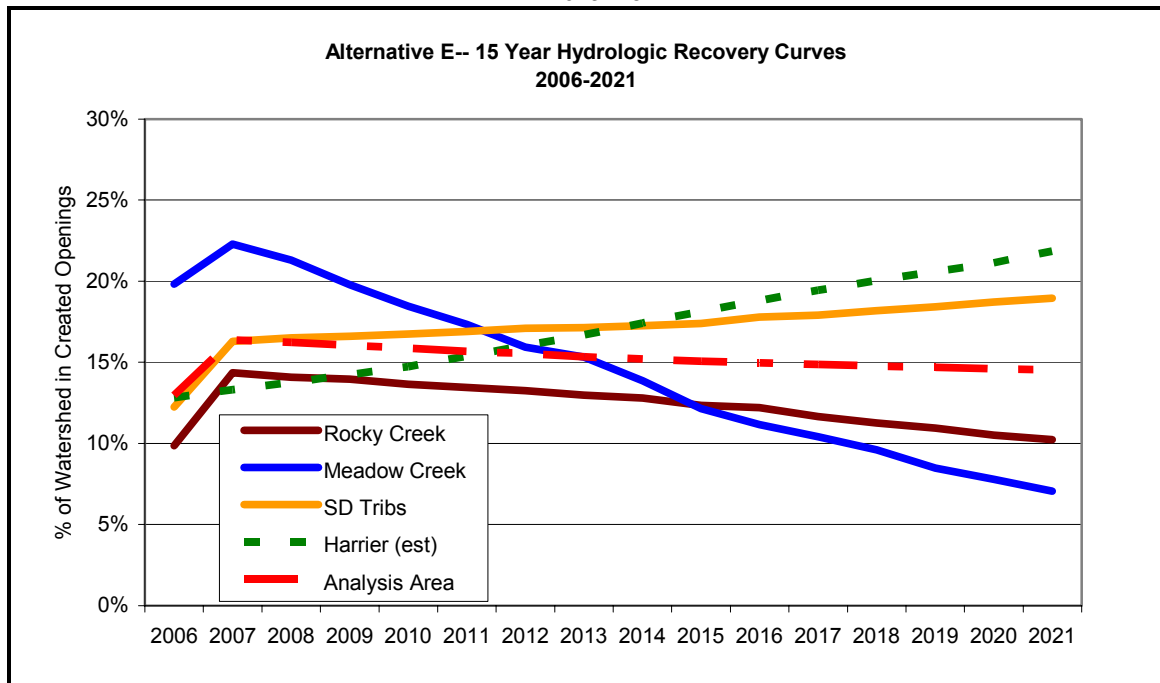
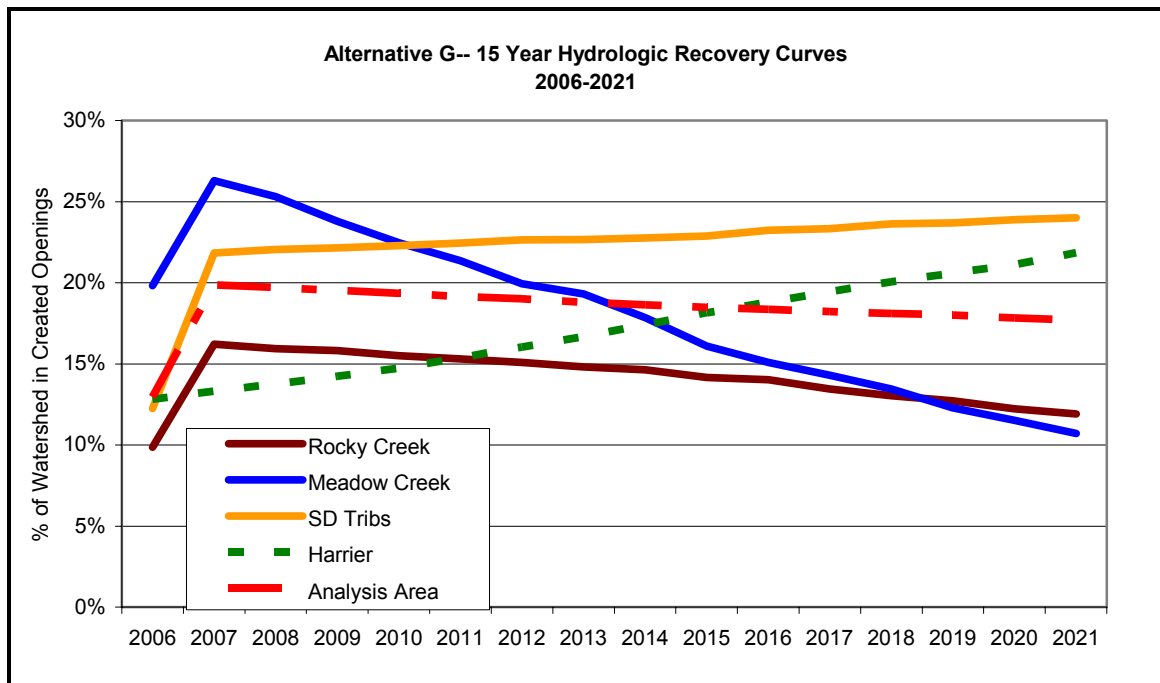


Chart 4-7



The Meadow Creek subwatershed will exceed the forest plan threshold of concern in Alternative G. The model indicates that the threshold will be exceeded for approximately two years after implementation in 2007. (See Chart 4-7) The maximum Equivalent Clearcut Acreage value modeled for Meadow Creek will be 26.3% in Alternative G. None of the other 3rd order subwatersheds will exceed the 25% threshold in Alternative G. None of the subwatersheds (including Meadow Creek) will exceed the 25% threshold in Alternative E. The recovery curve in Meadow Creek drops faster than the other subwatersheds in the

project area because many of the harvest units in this basin are older and recovering faster than watersheds with more recent timber harvest. It is likely that deep, permeable, glacial soils in these moderately sloping basins of the project area are adequately buffering the effects of increased created openings.

The hydrologic recovery curve in Harrier Creek and the South Deep Tribs continues to rise under both Alternatives E and G. This is the result of future logging that is estimated will occur over the next 15 years on non-federal land in these subwatersheds. This is also the trend in the No Action Alternative A. It is unknown if this level of logging is sustainable in the future as projected in the model. The hydrologic recovery in the entire South Deep Analysis Area continues in spite of estimated increases in the South Deep Tribs and Harrier Creek. If logging on non-federal lands does continue as projected the increases in water yield will be confined to the lower elevation areas and the mainstem of the South Fork. Neither subwatershed will exceed the 25% threshold of concern during the next 15 years. Hydrologic recovery is expected to continue in the headwaters and no increased channel-forming flows from federal lands are expected to cumulatively degrade channel conditions along the mainstem of the South Fork.

All vegetation treatments were modeled within the same year (2007). In reality this never occurs on a project of this size. The activities are usually spread out over a period of 3 to 5 years. This may result in several timber sales spread over an even longer time period. This will flatten the Equivalent Clearcut Acreage peak shown on the charts, and will probably result in real Equivalent Clearcut Acreage values less than those displayed in this model. The charts display the results of the model by subwatershed and for the total South Deep Analysis Area. The most sensitive areas that could be affected by increased are along the lower reaches of Rocky Creek and Meadow Creek where county roads constrict the stream channels and where channels were degraded by the storm of 1996. Bank erosion and downstream deposition in the low gradient reaches and in storage behind large woody debris are the most likely impacts should such flows occur. Based on the Equivalent Clearcut Acreage model, South Deep riparian surveys, and field observations of watersheds displaying similar Equivalent Clearcut Acreage values, any increase in the average duration of near bankfull flows is not likely to result in detrimental channel conditions. Stream banks are well vegetated and stable in most areas of the watershed and channels are capable of handling increased flows. The channels in this watershed are probably capable of carrying higher flows than those currently occurring in the watershed due to the current dense stocking levels and increased evapotranspiration rates.

The dam at Big Meadow Lake is located at the top of the headwater reaches and is therefore will not be affected by any cumulative flow increases further downstream in the watershed. An emergency spillway will relieve pressure on the dam from any peak flows that directly enter the lake behind the dam. This spillway normally functions during high water during spring snowmelt runoff. The risk of catastrophic dam failure associated with proposed treatments is almost non-existent.

Potential increases in high magnitude peak flows due to rapid snowmelt caused by snowpack exposure to rain or warm winds is somewhat more likely to occur under both alternatives since a reduction of stand densities will result in increased snow depths and increased solar radiation. Most of the activities proposed in both alternatives, however, are located in the snow-dominated zone of these watersheds. The risk of increased rain-on-snow events in these alternatives is small due to the limited area of proposed harvest within the rain-on-snow zone.

Peak stream flows are also influenced by the rate at which various parts of the watershed "melt off" during the spring runoff. Research at the Benton Creek experimental watershed at Priest River, Idaho has shown that clearcut areas on southerly aspects have melted out 3-4 weeks earlier than adjacent forest areas on the same slope. The acceleration of snowmelt, particularly at lower elevations in the watershed, will cause those south aspect cutting units to release water to streamflow prior to the peak runoff period for the watershed. The net result of this change in the melt pattern is that although an increase in the total flow has taken place, this increase will occur at a time when the channel has more cross sectional area to accommodate the flow. Increased flows will therefore have less erosive potential than if they had taken place during the peak discharge period.

The Benton Creek study also showed that on the north aspects there was no change in the timing of the melt following clearcutting. There are probably areas on north aspects within these watersheds that will melt out later than the peak discharge period. Increased flows from cutting units in these locations will

have less channel impact than if the increase came during the peak runoff period for the watershed. The Soil Conservation Service snow survey personnel have observed a retreat of the snowline in any watershed to approximately the same position each year during the peak discharge period. Areas located at higher elevations than this snowline and on north aspects will have most of the snowpack remaining during the peak discharge period for the watershed. Cutting units located in these high elevation, north aspect zones can be evaluated as contributing to increased flows after the peak discharge period for the watershed. As a guideline this high elevation, north aspect zone is defined as occurring:

- In the highest $\frac{1}{4}$ elevation zone of the watershed.
- Between 315° and 45° of north aspect.

Increasing the peak flow can affect the erosion and sediment production in a watershed by enlarging the duration of flow conditions which have the potential for scouring the channel bed, undercutting the channel banks, and transporting large amounts of sediment. (Benoit and Galbraith, 1974)

Using the results of this study, an informal analysis of the proposed commercial harvest treatments for both action alternatives was conducted using the district GIS aspect coverage. Most South Deep silvicultural prescriptions propose to remove 40% to 60% of the basal area in these stands rather than 80% to 100% typically removed during regeneration harvest such as the clearcuts used in the Benton Creek study. This would probably mean that units on low elevation south slopes would melt out 2 weeks early rather than the 3-4 weeks early concluded in the Benton Creek study. Proposed South Deep harvest units on aspects between ESE (112.5°) and WNW (292.5°) were analyzed as having a south aspect. The proposed units were almost evenly divided between north and south aspects in both alternatives. If the parameters used to define a north aspect are further reduced (WNW to ENE) the unit distribution remains about the same (evenly divided for both alternatives). Many of the units in Rocky Creek and the north block of South Deep Tribs (lone Hill and Miller Creek) have north aspects. The Meadow Creek units are about evenly divided between north and south aspects. The South Deep Tributary units on the east side of Rogers Mountain are primarily located on south slopes. Many of the north aspect units in Rocky Creek and Meadow Creek are located in the higher elevation headwaters. Based on this brief review it does not appear that there will be an appreciable increase in peak flows in either action alternative resulting from timber harvest activities on various aspects within the watershed.

Floodplain, Wetlands, and Groundwater

Sediments from proposed activities will cumulatively be stored along low gradient floodplains and wetlands especially along the mainstem of the South Fork. These sediments will originate at various locations in the headwaters of these watersheds and be transported during spring runoff and large storm events. Most of the management generated sediment will come from the influence of existing riparian roads and increased traffic levels for timber haul.

Activities will be implemented at scattered locations within the watershed over several seasons of work under the timber sale contract. This will tend to spread out the effects on water resources so they will not be concentrated in one area over a short period of time. The management related sediment supply is expected to drop to a new baseline level within several years after the project is completed due to decreased levels of traffic and increased vegetation at disturbed sites. Cumulative effects are therefore; expected to be minimal in downstream areas of these watersheds from proposed management activities. It is likely that the effects of sediment generated as a result of these proposed activities on federal lands will be masked by the sediment supplied from activities occurring on non-federal lands, county roads, and the recent 1996 storm event. The impacts from the proposed activities should be undetectable using current monitoring techniques and within the existing range of variation in this watershed. Proposed improvements to existing roads at stream crossings (i.e. surface aggregate) are expected to reduce long-term sediment delivery to wetlands and floodplains over existing levels.

Detectable levels of groundwater function are not expected to change within the watershed because of the short-term, localized nature of the proposed activities.

4.1.3 Fire, Fuels, and Air Quality: Effects of the Alternatives

The following analysis is derived from the Fire, Fuels, and Air Quality Report for the South Deep Management Project and is available for review in the analyses file at the Three Rivers Ranger District office.

Alternative A – No Action

Direct and Indirect Effects

Fuels treatment would not occur. Smoke production, except wildfire, would not happen. There would be no direct effect unless there was a wildfire in the project area within the next few years.

Indirect effects would be:

- No National Fire Plan objectives would be met.
- Risk of catastrophic fire remains high within and outside the wildland urban interface.
- Homes, improvements, private property, and natural resources remain at higher risk from destructive wildfire.
- Overstocked stand conditions would continue to foster insect and disease problems, which accelerate dead fuel accumulations. This situation adds to fire intensity and fire suppression difficulties. Firefighting in the wildland urban interface under these conditions is dangerous to firefighters and the public.
- Public attitudes about government land management would not meet the expectations of neighboring landowners who realize the dangers of hazard fuels.
- Wildfire suppression costs are high compared to fuels treatments, so there could be a monetary cost associated with no action.

Alternatives E and G

Direct and Indirect Effects

Fuels Reduction

Homes, structures, improvements, private property, and natural resources adjacent to National Forest System lands would become less susceptible to damaging wildfire as hazardous fuels conditions are treated. The fuels hazard within the wildland urban interface would be decreased as:

Surface fuels, existing dead-down and post harvest slash, would be reduced through prescribed fire, grapple piling, leave tops attached, lop and scatter, and handpiling. This affects the intensity and rate of spread of wildfire.

Ladder fuels would be reduced by mastication, and whipfelling. This would increase crown base height making it more difficult for crown fire to initiate.

Canopy bulk density would be reduced through commercial harvest. This would space the tree crowns apart making crown fire less likely.

Crown fire and spot fires would be less likely near private improvements should a fire spread from the National Forest.

Fire suppression in the wildland urban interface can be attempted with greater success by ground forces. Air resources can more easily suppress fires where timbered canopies have been opened up to allow aerial retardants and water to penetrate to the ground.

Commercial treatments in both alternatives reduce crown bulk density and would reduce the risk of uncontrolled wildfire. However, Alternative G best reduces the risk of uncontrolled wildfire within and outside the wildland urban interface. Alternative G will:

- Treat more commercial acres inside the wildland urban interface.
- Treat more surface fuels.
- Treat more ladder fuels.
- Reduce canopy bulk density on a larger scale than would Alternative E.
- Constructs more roads.

Table 4-8. Fuels Treatment Acres in South Deep Watershed

	Alternative E	Alternative G	No Action
Commercial Acres in WUI, CBD (canopy bulk density) Reduction	908	1,336	0
Commercial Acres out of WUI, CBD Reduction	3,704	5,785	0
Surface Fuel Reduction Acres, Jackpot Burning, Commercial And Non-commercial	1,775	2,158	0
Surface Fuel Reduction Acres, Grapple Piling (commercial only)	349	1,377	0
Surface Fuel Reduction Acres, Handpiling (commercial only)	37	46	0
Ladder Fuel Reduction Acres, Whipfelling (commercial only)	1,431	2,962	0
Ladder Fuel Reduction Acres, Mastication (commercial only)	1,116	1,406	0
Acres in WUI, Shaded Fuelbreaks	140	87	0
New Road Construction, Miles	0	4.9	0

Table 4-9 displays surface fuel loading for the entire project area. An estimate of 15 tons per acre of surface fuels was used as an average. This average is based on field surveys and stand exam information. An estimate of 8.5 tons per acre of created fuels was used as an average. This average is based on an average number of trees per acre harvested and was estimated from the publication Handbook for Predicting Slash Weight of Western Conifers (Brown et. al. 1976) When you add the existing fuel loading to the created loading from commercial harvest you get total surface fuel loading.

Table 4-9. Estimation of Surface Fuels in Total Tons Before and After Treatment – Whole Project

	No Action	Alt. E	Alt. G
Existing Surface Fuel	0	69,180	106,815
Average Tons/Acre	0	15	15
Created Fuel	0	39,202	60,528
Total Surface Fuel Loading (existing)	0	108,382	167,343
Grapple Pile Disposal	0	6,282	24,786
Jackpot Burning	0	7,362	9,810
Landing Disposal	0	26,690	34,765
Hand Pile Disposal (includes fuelbreaks)	0	1,770	1,330
Natural Fuels	0	1,644	2,739
Total Fuels Consumed	0	43,748	73,430
Fuels After Treatment	0	64,634	93,913
Average Tons/Acre	0	14	13

Table 4-10 estimates surface fuel loading for the wildland urban interface (WUI) only. Surface fuels in the wildland urban interface were treated more aggressively.

Table 4-10. Estimation of Surface Fuels in Total Tons Before and After Treatment – WUI

	No Action	Alt. E	Alt. G
Existing Surface Fuel	0	13,620	20,040
Average Tons/Acre	0	15	15
Created Fuel	0	7,718	11,356
Total Surface Fuel Loading (existing)	0	21,338	31,396
Grapple Pile Disposal	0	2,250	6,624
Jackpot Burning	0	1,926	3,774
Landing Disposal	0	3,360	5,408
Hand Pile Disposal (includes fuelbreaks)	0	1,770	1,330
Natural Fuels	0	2,739	2,739
Total Fuels Consumed	0	12,045	17,215
Fuels After Treatment	0	9,293	11,521
Average Tons/Acre	0	10.2	8.6

Cumulative Effects

Treatments within the wildland urban interface would have a positive cumulative effect if private landowners perform fuels reduction work around structures and property boundaries. If wildland urban interface treatments are maintained over time, maintenance activities in the form of underburning or whipfelling would likely be necessary every decade or two to refresh the effectiveness of hazard fuel reduction work. The treatments would have a positive cumulative effect by improving the ability of fire resistant species to be competitive and survive.

The past, present, and reasonably foreseeable future actions that could contribute to cumulative effects are past timber sale harvest and post harvest fuels treatments. Slash created from the South Deep project would not likely overlap with past timber harvest generated slash. Most of the slash from past harvest activities was treated with prescribed fire and grapple piling. The slash that was not treated has had time to decompose. The fuels treatments that are proposed under Alternatives E and G are also being treated with jackpot burning, grapple piling, and mastication. At a landscape level the South Deep Management Project and past harvest and fuels treatments would reduce the risk of catastrophic fire due to fewer surface fuels and a more open canopy.

Both of the action alternatives would cumulatively reduce the risk of high severity crown fire. Alternative G would have a greater cumulative effect to reduce fire behavior at the landscape level, because more trees would be removed and more surface fuels would be treated.

Air Quality and Burning

Under both Alternatives E and G, direct effects would be seen as smoke from prescribed fire in both natural fuels units and commercial thinning units. Smoke is generated most copiously during the first few hours of prescribed fire, tapering off as the fuels consume. When winds are light, ignition is generally stopped before evening so smoke has a chance to dissipate. Smoke from residual burning may settle into the valleys during the night.

Based on past experience, the impacts of smoke on private citizens is short term. Smoke may be seen from view points, and some residences. Smoke may be smelled by the public but it should not be intrusive into homes. Generally, smoke would dissipate by morning and residual smoke would be noticed only for 1-2 days after ignition and would not adversely affect the public.

All prescribed fire activities take place during spring or fall. While the possibility of prescribed fire escaping always exists, that possibility is mitigated by thorough planning and documentation in a burn plan for each burn. Each site-specific burn plan includes steps to be taken should a prescribed fire exceed its planned prescription and includes a geographical and resource contingency plan to bring the fire back into prescription.

The risks of escape can be mitigated by using common firefighting tactics to limit fire spread. Safeguards to contain fire may include firelines, black lines, wet lines, natural barriers, or roads. Burning is done when weather and fuel moisture conditions are such to make unmanageable fire behavior unlikely, such as during the spring or fall. Burns are monitored until they can be declared out.

Alternative E would apply fire to 3,389 acres, either to reduce slash or natural fuels, while Alternative G would apply fire to 4,872 acres, also to reduce slash or natural fuels. Because Alternative G treats more acres it would produce more smoke emissions.

Air Quality and Crushed Stone Processing

Under both action alternatives, two proposed sites within the South Deep Planning Area would be used for crushed stone processing, and would generate a large amount of dust. A pit is located in T37N, R.41E, NENE Section 2, adjacent to the 1700267 road near the 1700255 junction. The second pit is located in section 33 next to the 7018122 road.

Rock and crushed stone products generally are loosened by drilling and blasting, and then are loaded by power shovel or front-end loader into large haul trucks that transport the material to the processing operations. Techniques used for extraction vary with the nature and location of the deposit. Processing operations may include crushing, screening, size classification, material handling, and storage operations. All of these processes can be significant sources of particulate matter and particulate matter 10 emissions if uncontrolled.

The Washington State Department of Ecology monitors emissions from all crushed stone processing activities to assure air quality compliance. Mitigation measures for compliance require that the Forest Service provide a water source to the contractor for on site dust abatement.

Cumulative Effects on Air Quality

Smoke produced from combustion has potential to combine with smoke from other burn areas on the District or combine with smoke from burning being done on adjacent Forest Service Districts, other agency lands, and/or private lands. Smoke can also mix with residual smoke from the previous day's burning adding to the total production of smoke. However, the action alternatives are unlikely to pose adverse cumulative effects from smoke because smoke emissions from controlled burns are occasional short-term events that disappear in the large-scale motions of daily wind and rain. Cumulative effects of

controlled burn smoke in the atmosphere are negligible since natural atmospheric processes work to rid the air of particulates over time. State and national air quality regulations work to limit the rate of emissions so the production of particulates does not exceed the natural cleansing processes of the atmosphere. Permissions are granted for controlled burning emissions only after ambient air quality is considered. In other words, the everyday activities that produce vehicle exhaust, dust, home stove smoke and other emissions are taken into account before smoke from forestry and agricultural burning is permitted. Therefore, controlled burning smoke, when compared to other human activities, is a transient product unlikely to produce lasting effects on a localized area. Current smoke management techniques and air quality regulation are working to minimize adverse aesthetic and health effects over the general area of Eastern Washington.

4.2 Biological Environment

4.2.1 Forest Vegetation: Effects of the Alternatives

The following silviculture analysis is derived from the Silviculture Report for the South Deep Management Project and is available for review in the analyses file at the Three Rivers Ranger District office.

This section will discuss the effects likely to result from the proposed vegetative treatments as described for each alternative. The purpose and needs of the proposed treatments will be to: reduce the risk of stand replacing wildfires, improve forest health, and help sustain local sawmills and communities. The objectives of treatments include tree growth redistribution, control of tree species composition, timber harvest, and reducing wildfire hazard potential. The approach is based on managing tree density and species composition with silvicultural systems at the landscape scale that includes a mix of variable retention and regeneration harvest systems, fuel treatments, and prescribed fire.

Environmental impact to a specific site from tree felling, and log yarding, precommercial thinning, mechanical site preparation for planting and fuels reduction and prescribed fire fall into three broad categories:

1. Effects to residual vegetation;
2. Modifications to the forest floor;
3. And collateral effects on adjacent stands.

These impacts may be beneficial, neutral, or adverse with regard to achieving the desired ecosystem condition and functions.

Alternative A – No Action

Direct and Indirect Effects

Alternative A is the no action alternative. This alternative is required by law and serves both as a viable alternative in itself as well as a baseline for comparison of the effects of all the alternatives. Although the words “no action” implies a simple “natural” or passive management approach, taking “no action” could have major long-term negative impacts to ecosystem functions and processes in upland forest environments and to the native species that inhabit them. The effects would vary based on a number of unpredictable factors including: the continued success of fire suppression efforts, wildfire and climatic conditions. Accomplishment of these desired outcomes requires a *combination of actions*, including commercial timber harvest as well as other cultural treatments.

This alternative would result in no improvement in stand vigor and related forest health or moving the stands toward target conditions on Forest Service administered lands. Stagnated stands within the proposed project area left untreated will lack adequate crown and diameter development. Structural development will be delayed due to the lack of or a suppressed understory. No treatment would also delay moving stands toward the historical range of variability especially in stands that are proposed to be treated to move towards structural stage 6 or 7. In treatment areas that have the potential to be moved toward structural stage 6 or 7, encroachment of more shade tolerant species have created a hazard due to the increased fuel loading and ladder fuels. Stands would continue to be a high risk to uncontrolled wildfires. If a fire was to occur many of the preferred seral leave trees i.e., western white pine, western larch, and ponderosa pine may be killed by the fire and the site would be delayed in moving towards stage 6 or 7. Natural fires may or may not burn under conditions that would thin out the smaller trees and would have limited control over residual tree spacing and species selection. High intensity fires can reduce soil productivity drastically and cause major changes in the hydrological and erosion processes (Hessburg et. al. 1999). Severe fires can also cause stand destruction and create potential brushfields that may persist for many years. Silvicultural treatments to reduce stocking levels and improve stand vigor or to plant serals such as, western white pine, western larch, and ponderosa pine would not occur under Alternative A. Conversion of stands to shade tolerant species will continue, increasing the future hazard to insects and diseases. This alternative would not treat stands that occur along the wildland urban interface to reduce the risk of insect, disease or wildfire. Since no harvesting will take place the economic value of the dead and dying trees would not be recovered. Money would not be generated from timber sales to aid in monitoring, stand improvement, wildlife, fisheries, recreation and fuel reduction projects. Within the next ten year period the risk of insect outbreak and the risk of increased levels of disease would be moderate to high. In the long term, the risk of insect outbreak in the next twenty to thirty years would be high. Forest health would not meet standards set forth in Forest Plan. Approximately 3,250 acres of high priority or 5,200 acres of medium priority stands would not be treated.

Stands would become increasingly susceptible to tree-killing insects and pathogens particularly mountain pine beetle, fir engraver, Douglas-fir beetle, root pathogens, and spruce budworm. This alternative would not treat any acres of diseased trees. While the Douglas-fir beetle outbreak has subsided, populations will likely remain high for several years, causing a higher level of mortality compared to endemic population levels. If another wind or storm event occurs population levels would increase causing additional mortality. Understories would fill in with shade tolerant seedlings or brush. In some cases, late and old multistoried stand infested with Douglas-fir beetle would revert to middle or early structure. The genetic base of the stand may decrease as the mortality of the larger more vigorous trees increases. Other insects such as mountain pine beetle, fir engraver, spruce budworm, Douglas-fir tussock moth, and western pine beetle could increase.

The aspen component of the landscape would likely diminish over the next 20 years. In the short term, the landscape vegetation will continue to become increasing homogeneous. A shift in plant and animal species would correspond to the shift in vegetative habitats.

As unmanaged densely stocked small diameter stands develop, they are likely to become more vulnerable to storm damage, including windthrow, as well as damage from snow and ice. The increased susceptibility is due to the individual tree form in overly dense stands. Under extreme conditions, such as those characterized by densely stocked small diameter stands, the trees become too tall and slender to provide adequate support (generally, the height-diameter ratio is excessive). As a result, such trees, and stands, may not be stable. Damaged stands may not be economically salvable because of small tree size. If these stands are not salvaged, buildup of fuels and deadwood could contribute to risk of uncontrolled fire. In stands with large amounts of Douglas-fir, there would be increased risk of outbreaks of Douglas-fir beetle.

Under Alternative A, the landscape and the ecosystems that compose them will continue to "age". The process of forest aging called succession transforms the composition of forested ecosystems as biotic communities respond and modify their environment. Stand vulnerability to disturbance is increasing along with the potential for a stand replacement fires versus a mixed fire severity historically common in interior mesic forests. Dense multi-layered canopies across larger contiguous portions of the landscape have resulted. With these changes has come a propensity to host tree-killing insects and pathogens as

well as increasing the probability of an uncharacteristic fire event. This alternative would not reduce stocking levels nor begin to convert multi-storied stands toward single storied stands. Tree densities would continue to be excessive, stand vigor would continue to decline. The continued exclusion of fire supports increased levels of dead trees and down material compared to historic levels. Dead wood would add to the fuel component of the stand, increasing the risk to stand replacing fire. Current forest understories have grown dense with fire-susceptible species, and “fuel ladders” from the ground to the tree canopy. Results of analysis show increasing risk of insect/disease, fire, or both across the watershed in the uplands. If a wildfire escaped initial control, it would be increasingly difficult to suppress and likely create fire intensities much greater than those found historically thereby increasing tree mortality, the percent area severely burned, and erosion potential. Fire suppression and fire rehabilitation funds would likely be needed.

This alternative does not address key findings of the watershed level analysis. We would not be working toward our conservation challenge of sustainable ecosystems. The reference SS7 habitat located within National Forest System lands has acquired a second or third cohort and as noted in the preceding discussion, has become SS6 habitat. Using the precept that these native species have evolved with reference disturbance regimes and with landscape patches and structural patterns that result from them, the decline in habitat infers a corresponding decline in the native landscape diversity and the subsequent biological diversity and viability of various plant and animal populations.

Loss of ecological integrity and resiliency would remain high under the no action alternative. Species such as pinegrass, common snowberry and others have a competitive advantage over species that rely entirely on seeds. Reduction of soil organic matter and soil wood has the potential to reduce site capacity to support trees on dry Douglas-fir ninebark sites. The potential result of a stand replacing fire could favor persistent shrubfields that are unable to support trees for years.

The existing Historical Range of Variability trends show excess of early and middle structural stages and a deficit of late structure. Mortality in the larger diameter Douglas-fir trees is converting some Structural Stage 6 stands back to Stages 4 and 5 where there are already large excesses. Deferring treatment of densely stocked stand would not move the stands toward late structure. Analyzed against the objectives of maintaining and improving the representation of structural stages within the Historic Range of Variability, as appropriate to biophysical environment, this alternative would provide the lowest level of ecological integrity. The vegetative trend is for the majority of the uplands to be a large homogenous blocks of structural stages 3, 4 and 5 versus the mosaic present during historic levels. Existing patch sizes tend toward the lower range of what historically occurred.

Under the Forest Plan, as amended, 60 percent (MA-7, 18,028 acres) of the National Forest System lands in South Deep is to be managed to achieve the production of timber products, while with 17 percent (MA-5, 3975 acres) is to be managed for scenic values and wood products. There is no timber harvest proposed in Alternative A, no recovery of timber volume. It would be unlikely any planting of seral tree species would occur to provide diversity and help ensure they are retained. Without treatment, species such as aspen, western white pine and western larch would continue to diminish in numbers. In turn, their absence would allow certain insects and pathogens to play a more decisive role in shaping vegetation patterns on the landscape. Without funding derived from the timber sale process our ability to fund many projects would likely be more limited. The economic feasibility of salvaging desired material would be contingent on a number of factors including the deteriorating nature of the wood, access, and market conditions.

Riparian areas are an important part of a properly functioning ecosystem and are not a continuous condition across the landscape. They are interspersed with other vegetation types and conditions. Currently, upland riparian areas are in good condition. However, under the No Action Alternative, because the continuity of fuels across the landscape is found in the canopy and the spread of uncontrolled wildfire tends to be affected more by weather than existing vegetation structure, there is an increased probability of a uncharacteristic high intensity fire being carried through the riparian systems with detrimental effects. The loss of vegetation cover would alter current and future wildlife habitat, cause changes in stream hydrology, and bring high risks of flooding and mass wasting. Detrimental effects would include: a decrease in habitat quality, loss of soil, decrease in water quality, increase soil temperatures, increase sedimentation, decrease fish habitat, increase erosion potential, shift of native

fauna and flora, decrease or homogenization of forest stand structure to earlier successional stages, alter riparian canopy functions, and alter nutrient recycling and ecological integrity.

Throughout all alternatives including the No Action, other ownerships will continue to have harvest activities. The Forest Practices Applications identify the percent basal area removed in the proposed treatment. From these estimates of basal area removed, the acres treated were assigned a silviculture prescription to aid in comparing the effects.

Effect Common to Alternatives E and G

Direct and Indirect Effects

The timber sale activities included with the action alternatives (Alternatives E and G) share the same objective. Merchantability specifications are 6-inch diameter at breast height for lodgepole pine and 7-inch diameter at breast height for all other species.

Vegetative patterns on the landscape are aggregates of different forest and non-forest cover types and reflect the composition and structure of their component stands. This vegetative mosaic will change over time in response to ecological succession which is driven by plant community development and disturbance events. Continued implementation of fire suppression, vegetation management along with any natural disturbance events will inevitably alter forest composition and structural stages across the South Deep project area. Current policy to suppress wildfire will continue throughout the project area.

Alternative E

Direct and Indirect Effects

Alternative E is designed to limit the effects of new road construction and prioritize treatments within the wildland Interface boundary. It focuses treatments within the wildland urban interface without any new road construction. Alternative E would commercially harvest 4,612 acres using 192 acres of even-aged regeneration treatment methods to initiate a new stand, 2,771 acres using uneven-aged regeneration treatment methods to initiate new cohorts within a stand, and 1,489 acres using stand thinning, release³ and improvement⁴ cutting techniques not designed to initiate regeneration at this time. In addition, precommercial stocking and composition control would be undertaken on plantations covering 2,137 acres and 379 acres within units, fuel treatments on 1,053 acres, post and pole opportunities on 131 acres, hand piling for fuel reduction on 52 acres, whip felling on 1,503 acres to treat ladder fuels and release trees, lop and scatter on 76 acres, mechanical site preparation on 464 acres, mechanical integrated stand improvement on 1,116 acres and planting treatments on 507 acres and jackpot burning for site preparation and fuel reduction of 1,133 acres. The tops of trees would be left attached on 3,087 acres to reduce fuels within the unit.

Alternative E would treat approximately 1,624 acres or 50 percent of the total 3,253 acres identified as high priority for treatment due to forest health concerns. In addition, 2,338 acres or 45 percent of the moderate priority stands will be treated. This alternative limits treatment of high and medium priority stands in the wildland urban interface to 352 acres of high priority stands and 318 acres of medium priority stands due to access limited to existing roads. In lieu of stand treatments, shaded fuel breaks are designed to reduce fuel hazards within the wildland urban interface boundary.

³ Release is a treatment designed to free young trees from undesirable, usually overtopping, competing vegetation.

⁴ Improvement cutting is a treatment made in a stand past the sapling stage primarily to improve composition and quality by removing less desirable trees of any species.

Residual Vegetation

Tree felling, yarding of logs, site preparation, planting, and slash disposal treatments would result in various residual stand conditions. On the ground, the retention system will resemble several other silvicultural systems. The primary difference is the focus on retaining structural elements of the original stand to maintain long-term ecological diversity and management objective verses a regeneration objective. In portions of a unit (cut areas), it will be fairly open similar to the clearcut or seed tree silvicultural system. In others situations, it would be a relatively intact canopy similar to a single tree selection. To accomplish retention objectives, a number of treatments will occur to create a mosaic of stand conditions. The forest cut areas will occur between leave tree patches. The size and distribution of the cut areas will be based on the locations of pockets of moderate to heavy dwarf mistletoe, root disease, etc. Cut areas will be irregularly shaped and when possible will be feathered from other leave trees and adjacent plantations or past harvest units. Based on the existing condition of the stand forest cut areas will from 1/8th of an acre to 15 acres.

Where even-aged regeneration techniques are prescribed, stands would initially become forest openings with grouped or dispersed reserve trees (4-30 trees per acre). The majority of understory trees on these sites would be treated to prepare for planting or natural regeneration. Retained seed trees and reserves on all even-aged cutting units would be expected to experience from 10-35 percent attrition in the first decade after treatment from incidental windthrow, snow breakage, and mortality of logging and fire damaged trees. Leave tree selection, yarding systems, unit orientation and location, and burning prescriptions are designed to keep reserve tree attrition within these limits. These areas are expected to regenerate either naturally, or desired tree species would be planted underneath an irregular but well distributed cover of healthy and vigorous coniferous forest. These planted trees would be expected to become established within five years. Less than one percent of the project area would experience these site specific effects to residual vegetation.

Uneven aged regeneration treatments would result in an irregular mosaic of open forest interspersed with forested openings. Understory tree strata and shrubs would be reduced across the treated area but not eliminated from the stand. Retained trees would generally be vigorous and composed of a diversity of site suited species. As with even-aged treatments, residual trees in these uneven aged treatments commonly experience from 10-35 percent attrition in the first decade following treatment. Typically two or more cohorts or stand age classes would remain in the treated stand and a new cohort of mixed coniferous natural regeneration would establish in the first decade following treatment. Approximately 9 percent of the project area would exhibit these effects under Alternative E.

Commercial harvesting treatments not intended to initiate a new stand would occur on approximately 5 percent of the analysis area. These treatments would improve the vigor and dominance of the best dominant and codominant trees by removing most of the lower crown class trees (e.g. thinning from below). On sites with suitable fuel conditions and fire resistance in the residual overstory trees, this would be accomplished by burning or harvest and burning while in other cases, it would be accomplished solely with harvesting. Stands would remain mostly stocked though incidental openings from windthrow, snow breakage, logging or fire damage are anticipated. Residual crown bulk densities, crown heights, and surface fuels would be modified in ways that reduce the potential for crown fires to occur within the stand.

Fuel treatments intended to reduce fuels are planned for approximately 4 percent of the analysis area. These treatments would result in creating several small fire-killed patches of pole-sized timber on the landscape. They were designed in conjunction with adjacent harvest and underburn units or with aspen stands to facilitate burning and emulate natural fire patterns. Fire-killed trees are expected to provide natural regeneration either from residual seed or sprouts and protection for new seedlings from browsing and the drying effects of wind and sun (Oliver 1998). Natural regeneration and/or supplemental planting of desired tree species would occur within five years. Precommercial treatments to reduce stocking or to alter species composition would occur on approximately 7 percent of the analysis area under this alternative. Sub-merchantable stands would be mechanically thinned or weeded of less resistant or vigorous trees to favor fire adapted tree species, retain diversity of undergrowth vegetation, and reduce long term fuel build up. Planting of rust resistant white pine, western larch, and ponderosa pine seedlings would augment the mix of natural regeneration.

Modification of the Forest Floor

Methods used to apply vegetation treatments would differentially affect the ground surface and woody debris loading of treated stands. Effects on soil productivity and erosion potential are addressed in the Soils section. Effects on woody debris and suitability of the forest floor for development of desired vegetation are discussed below.

Yarding with crawler type tractors or rubber tired skidders is anticipated on 3,259 acres under Alternative E. This yarding method typically leaves five to ten percent of the forest floor disturbed by skid trails and landings. The skidding pattern dissects the treated area leaving irregularly shaped islands of vegetation, litter and coarse woody debris. This type of yarding disturbance has the greatest potential for introduction and spread of noxious weeds and other exotics. It can also afford mineral seedbed conditions more favorable to establishment of coniferous regeneration. Because these conifer stands are not uniformly distributed and may be densely stocked, tractor yarding is not effective at re-establishing desired species. Leave-top-attached yarding can be performed with this system, resulting in the reduction of amount of woody material left on the site. Depending on the site and the level of removal, effects could be beneficial, neutral, or adverse with respect to fuel hazard, nutrient cycling, and microsite amelioration. Leaving an acceptable range of tons per acre of coarse woody debris appropriate for each specific site would be required mitigation. Approximately 70% of the project area would be tractor logged. This yarding method typically leaves less than five percent of the forest floor disturbed by skyline corridors and log decks. The skidding pattern is usually parallel lines equidistant along a road or radiating lines from a road or ridge point leaving regularly shaped polygons of vegetation, litter and coarse woody debris. There is some potential for noxious weed introduction and spread under this system. Adequate seedbeds for regeneration of desirable vegetation are not created by this yarding method. This reduces total fuel loadings left on site. Leaving an acceptable range of tons/acre of coarse woody debris appropriate for each specific site would be required mitigation. Approximately 13% of the project area would be yarded in this manner.

Helicopter yarding would occur on 734 acres under Alternative E. Disturbance of the forest floor is negligible under this yarding system except at landings. Landings are designed to fit into suitable wide spots along roads and previously disturbed areas to minimize new impacts and disturbance. There is very little potential for noxious weed introduction and spread aside from landings and haul routes under this system. An estimated 16 percent of the project area would be helicopter logged.

Additional treatments after harvest of grapple piling of 464 acres, jackpot burning of 1,133 acres, and fuel treatments on 1,038 acres would reduce residual live vegetation and dead woody fuels while redistributing coarse woody debris and causing mineral soil exposure. These treatments would reduce hazardous fuels to acceptable levels, leave suitable microsites for tree establishment, provide for nutrient and carbon cycling, and favor vegetation adapted to site conditions. No follow-up treatments are proposed under this alternative where harvest treatment is expected to create desired residual stand stocking and forest floor conditions. Precommercial treatments to reduce stocking or to alter species composition would result in adding an irregularly distributed mat of felled small trees to the forest floor. There would be some short-term fuel hazard associated with these treatment areas, even though the hazard is mostly abated by isolation of these areas by roads and surrounding treated areas. Approximately 7 percent of the project area would be left in this condition.

Collateral Effects on Adjacent Stands

Possible impacts to adjacent stands resulting from proposed actions under Alternative E include windthrow, escaped fire, and accelerated spread of insects, disease, or weeds from treated stands. Windthrow is typical along lee edges of openings, near ridgelines and saddles and wherever saturated soil conditions are common. In general, proposed treatment units do not predispose adjacent stands to windthrow or breakage due to either location or lack of creation of large openings in the canopy. Levels of windthrow are expected to be inconsequential and not penetrate very far into adjacent stands.

Insect and disease spread from treated areas is possible because the implementation of treatments and creation of more open stand conditions often stress residual trees making them more susceptible to attack. They then become vectors for infesting adjacent stands. Most pathogens that move into stressed

residual trees are indigenous endemics acting as secondary agents. They are often transitional and function to cycle carbon and nutrients with only negligible losses to surrounding stands. Build up of certain bark beetle species and root rots, however, can pose a more serious threat (Hagle et al. 2003). In general, treatment specifications and standard mitigation measures such as reserve tree selection and slash disposal requirements disfavor the development of this category of pathogens, they may continue to be active within untreated areas on the landscape. Specific concerns related to one species of importance are the build-up of pine engraver beetles in ponderosa pine and lodgepole pine slash that later infest adjacent stands.

Cumulative Effects

When considered in the context of past, present, and reasonably foreseeable events that have affected or would likely affect vegetation conditions in the South Deep project area, changes in stand composition and structure described above in Alternative E would have long-term cumulative effects.

To improve stocking levels, stand vigor, and move structural patterns toward their historic ranges, 6749 acres in the proposed project would receive some type of silvicultural treatment. High density stands would be treated to reduce fuel hazards and susceptibility to insect and disease outbreaks. Site preparation and prescribed fire treatments would reduce the continuity of fuels and high fuel load which would reduce the risk of an uncharacteristic stand replacement fire. Encroachment of shade tolerant species would be reduced by repeated underburnings (see Fire report). In the short term, some thermal cover for big game would be reduced but would provide more suitable cover over the long term. Wildlife corridors, riparian buffers, or stands deferred this entry would continue to be at risk of insect and disease outbreaks. This alternative will reforest stands with rust resistant western white pine, western larch, and ponderosa pine.

New disturbance events from harvesting, burning, felling of sub-merchantable trees, integrated mechanical site preparation to reduce fuel hazard and release trees, and manual tree planting would occur on roughly 16 percent of the project area. In general, these disturbances would tend to move the landscape toward a historically representative mix by structural stage, reduce the potential for damaging forest insects and diseases and uncharacteristic wildlife damage. Introducing fire into the stands where it has traditionally been present may help with nutrient release, balancing soil microfauna and restoring other ecological processes. They may also create conditions on some sites for existing or new invasive weed species. Prescribed burning is unpredictable and can exacerbate forest pathogen problems and damage desirable trees. Natural disturbance events such as wildfire, windthrow, insects, and diseases would continue to influence stand compositional changes. Changes in stand structure on treated acres would move stands toward the desired mix of late structures that cumulatively would tend to create stands more resistant to crown fires, and non-lethal underburns, and break up fuel loads. As a result, wildfire would be less likely to be sustained as a lethal crown fire over a large contiguous areas.

The money generated from timber sales would help fund monitoring, stand improvement, wildlife, fisheries, recreation and fuel reduction projects. This alternative is estimated to produce 29.8 million board feet of timber. Approximately 93 acres of Forest service land along the urban interface will be treated in this alternative. These treatments along the urban interface will aid in reducing the risk of insect, disease and fires spreading from Forest service lands onto private and other ownerships lands. The ecosystem screening process identified that 1003 acres of early structures was treated, 3371 of middle stage, and 50 acres of Structural Stage 6 to Structural Stage 7. One stand of Structural Stage 6 (portions of commercial harvest unit NBE) would be entered to move toward structural stage 7 resulting in no net change over the existing condition. This stand is on a dry site and Structural Stage 7 is more appropriate for this site. This Structural Stage 6 stand does not meet the North Idaho Zone Old Growth standards.

Alternative G

Direct and Indirect Effects

Alternative G was designed to limit the effects of new road construction and prioritize treatments within the Wildland Interface Boundary. It would commercially harvest 7,121 acres using 1,183 acres of even-aged regeneration treatment methods to initiate new stands, 3,746 acres using uneven-aged regeneration treatment methods to initiate new cohorts within stands, and 2,171 acres using stand thinning, release and improvement cutting techniques not designed to initiate regeneration at this time. In addition, precommercial stocking and composition control would be undertaken on plantations covering 2,137 acres and 274 acres within units, fuel treatments on 1,053 acres, post and pole opportunities on 131 acres, hand piling for fuel reduction on 61 acres, whip felling on 3,197 acres to treat ladder fuels and release trees, lop and scatter on 36 acres, mechanical site preparation on 1,543 acres, mechanical integrated stand improvement on 1,355 acres, planting treatments on 1,617 acres, and jackpot burning for site preparation and fuel reduction on 1,631 acres. Top of trees would be left attached on 4,030 acres to remove fuels within unit. Site specific effects from these treatments are similar to those described above in Alternative E, but are proportionally more in extent across the project area. Alternative E focused treatments within boundaries of the wildland urban interface without any new road construction. Alternative G focuses treatments within boundaries of the wildland urban interface, proposed road building to access additional treatment areas, and provides long term access within the boundaries of the wildland urban interface. Similar to Alternative E, fuel reduction treatments are proposed both within and outside the wildland interface boundary, but Alternative G treats more acres of high and moderate priority stands both within and outside the boundaries.

Alternative G would treat approximately 2813 acres or 87 percent of the total 3253 acres that were identified as high priority for treatment due to forest health concerns. In addition, it would 3893 acres or 75 percent of the moderate priority stands. It would treat within the Wildland Urban Interface 632 acres of high priority stands and 555 acres of medium priority stands. Within the WUI boundary shaded fuel breaks were designed to reduce fuel hazards.

Twenty four percent of the 29,740 acres in the proposed project area would receive some type of silvicultural treatment to improve stocking levels, stand vigor, move the stands toward target condition and towards the historical range of variability of structural stages (table x). High density stands will be treated to reduce the future hazard of insect and disease outbreaks. Reducing the stand density levels, species selection and removing brood trees will be better accomplished through harvesting than by using prescribed fire alone. Prescribed underburning and site preparation treatments under controlled conditions will reduce the continuity of fuels and the currently high fuel loads which will reduce the hazard of a catastrophic stand replacement fire. The underburning, primarily in biophysical environments 3 and 5, would be accomplished under optimum fuel moisture levels to reduce the impact to the residual stand, protect the soils, maintain fire tolerant species, reduce fire intolerant regeneration and maintain stocking levels. Encroachment of shade tolerant species could be reduced by repeated underburnings periodically (see fire specialist report). Some thermal cover for big game would be reduced in the short term but would promote healthier and potentially more sustainable thermal cover stands over the long term. The stands in which the thermal cover has been reduced primarily due to the recent Douglas fir beetle outbreak should return to target condition in 15 to 20 years. Corridors for wildlife, or other stands, which may be deferred from harvest activity in this entry will still be at risk of insect and disease outbreaks. Using only a sanitation or salvage harvest in these stands would do little to minimize crown fire initiation or spread (Graham and others, 1999). These areas will continue to remain overstocked and at risk for a high intensity stand replacement fire. This alternative provides for reforestation with western white pine, western larch and ponderosa pine in the regeneration harvest units. Harvesting the dead and dying trees and thinning to reduce stocking levels will recover some of the economical value of the wood (see economical analysis for more information). This economic return could be used to aid in monitoring, stand improvement, wildlife, fisheries, recreation and fuel reduction projects. This alternative is estimated to produce 47.0 million board feet of timber. Approximately 93 acres of Forest service land along the urban interface will be treated in this alternative. These treatments along the urban interface will aid in reducing the risk of insect, disease and fires spreading from Forest service lands onto private and other ownerships lands. Also these treatments will help to protect the Forest Service lands along the urban

interface from these agents, which may spread from private or other ownership lands. The ecosystem screening process identified that 3,659 acres of early structures was treated, 6,800 of middle stage, and 65 acres of structural stage 6 to move toward structural stage 7. One stand of Structural Stage 6 (portions of commercial harvest unit NBE) would be entered to thin the understory and move the stand toward Structural Stage 7 resulting in no net change over the existing condition. This stand is on a dry site and Structural Stage 7 is more appropriate for this site. This Structural Stage 6 stand does not meet the North Idaho Zone Old Growth standards.

Table 4-11. Summary of Proposed Treatments by Alternative

Criteria	Alt A	Alt E	Alt G
Acres of Silvicultural Prescription			
Irregular Shelterwood Harvest (iHSH)	0	904	1,850
Shelterwood Harvest (HSH)	0	78	566
Commercial Thinning (HTH)	0	1,489	2,047
Clearcut with Reserve Trees (HCR)	0	114	617
Uneven-Age Management (HSL)	0	1,867	1,896
Sanitation Harvest (HSA)	0	21	21
Total Harvest Acres Scheduled	0	4,612	7,121
Percent of Acres Scheduled for Treatment	0	16	24
Pre-commercial Thinning (KV)	0	2,137	2,137
Stand Priority Treatment- Acres			
High			
Within Wildland Urban Interface	0	352	635
Outside Wildland Urban Interface	0	1,272	2,178
Medium			
Within Wildland Urban Interface	0	318	555
Outside Wildland Urban Interface	0	2,020	3,338
Low			
Within Wildland Urban Interface	0	172	197
Outside Wildland Urban Interface	0	473	213
Percentage of stands with moderate to high insect /disease proposed for treatment	0	47	79
Post Harvest Treatments			
Whipfelling	0	1,503	3,197
Mechanical Timber Stand Improvements	0	1,116	1,355
Non-commercial Thinning within units	0	379	274
Jackpot Burning	0	1,133	1,631
Grapple Piling	0	464	1,543
Fire Treatments			
Prescribed Fire	0	913	960
Shade Fuel Break	0	140	93
<i>Prescribed Fire</i>		900	138
<i>Shade Fuel Break</i>		900	138
Miles of New Road	0	0	4.9
Projected MMBF	0	29.8	47.1

Table 4-12. Comparison of Management Areas Treated by Alternative

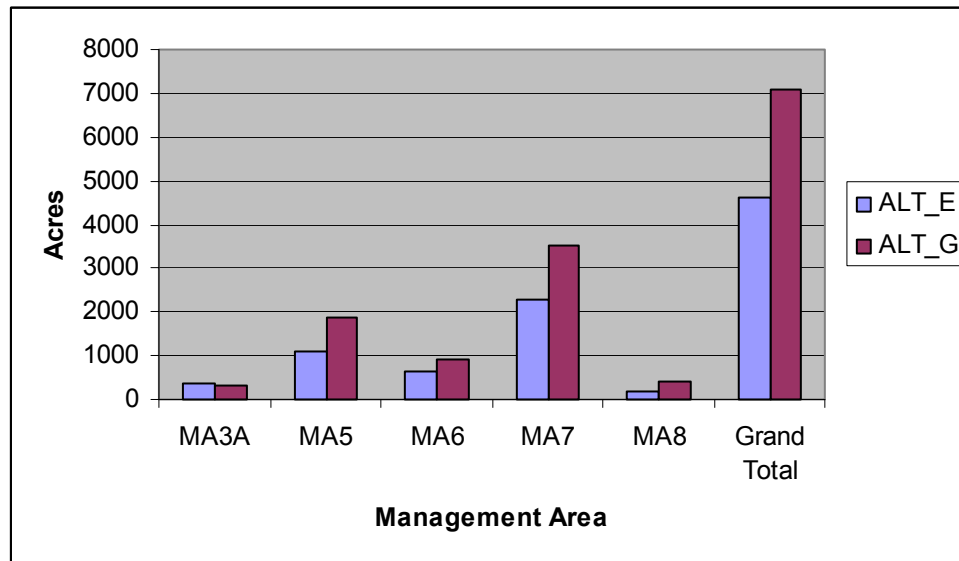


Table 4-13. Comparison of Priority Treatment Acres

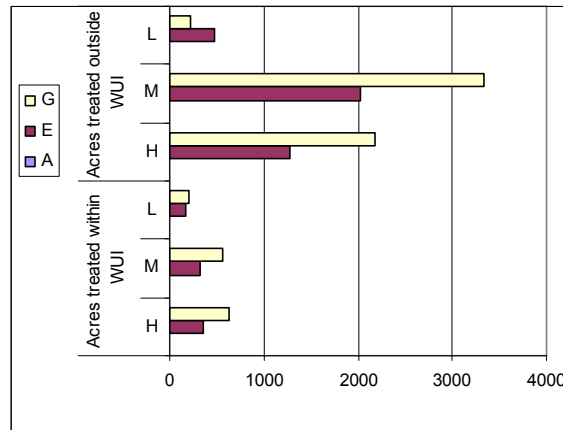


Table 4-14. Comparison of Commercial Treatment by Alternative

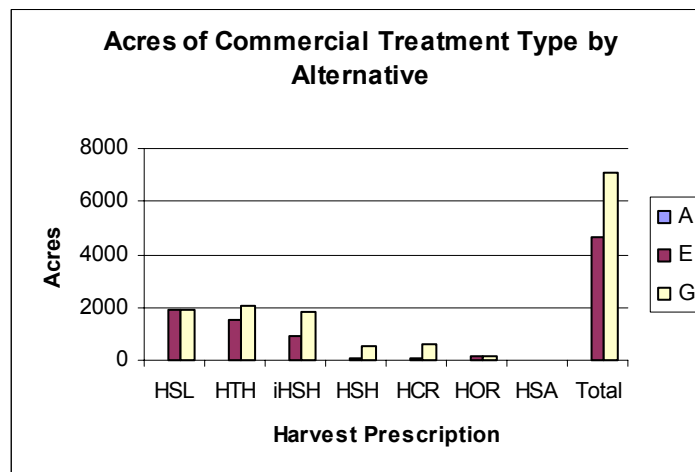


Table 4-15. Comparison of Alternatives, Currently Proposed and Past Harvests (all ownerships)

Acres Treated by Rx	Alternative A	Alternative E	Alternative G
HSL	69	1,936	1,965
iHSH	0	904	1,850
HSH	2,343	2,421	2,909
HTH	9,133	10,622	11,180
HCR	1,548	1,662	2,165
HCC	4,198	4,198	4,198
HOR	355	494	479
HFR	831	831	831
HSV	719	719	719
HSA	1,740	1,761	1,761
HSM	10	10	10
SDR	3	3	3
Total Acres Treated	20,949	25,561	28,070
% of Analysis Area Treated (All Ownerships)	41	51	56

* Treatments in Alternative A are for proposed harvest on other ownerships and past harvest activities on all ownerships. No current treatments are proposed on Forest Service land for alternative A.

Table 4-16. Stand Priority Comparison of Alternatives (Forest Service Land)

Treatment Priority	Alternatives		
	A	E	G
High Priority Stands			
Total High Priority Acres	3,253	3,253	3,253
Acres Treated	0	1,624	2,813
Percent Treated	0	50	87
Moderate Priority Stands			
Total Moderate Acres	5,202	5,202	5,202
Acres Treated	0	2,338	3,893
Percent Treated	0	45	75
Low Priority Stands			
Total Low Priority Acres	845	845	845
Acres Treated	0	645	410
Percent Treated	0	76	49

Summary

Under Alternative A, the no action alternative, future management objectives, such as moving the stands toward structural stages 6 or 7 may not be met. This is due to the increased insect, disease and suppression caused mortality, reduced diameter growth due to overstocked stands and the increased fire hazard that will result from not treating priority stands. This alternative also would not treat stands that occur along the wildland urban interface to reduce the risk of insect, disease or wildfire. Also there will be no money generated from timber sales to aid in monitoring, stand improvement, wildlife, fisheries, recreation and fuel reduction projects.

The primary difference between the two action alternatives is one of acres of high and moderate priority stands harvested. Alternative G, with the most acres of priority stands harvested, produces the most stocking level control, increased diversity in size classes and reduces stands that currently have insect and disease activity. With this increase in stocking level control, stand vigor and overall forest health

would also improve. Also stand movement towards target condition and towards the historical range of variability of structural stages would be accelerated.

The main silvicultural objectives for this environmental assessment are to reduced stand susceptibility to damage by forest pathogens and wildfire, meet Forest Plan standards including moving toward Historical Range of Variability, and increase vigor and resistance. This is best achieved by vegetative and prescribed fire treatments that reduce stand densities, incidence of insect and disease, and stress on the at-risk stands of trees. The Alternatives were ranked (3 = best, 1=worst) according to the probability of favorably impacting the different criteria in the table below. Alternative G ranked highest.

Table 4-17. Comparison of Alternative

Criteria	Alt A	Alt E	Alt G
Tree vigor/stand density	1	2	3
Wildlife habitat needs	1	3	2
Understory Fuels	1	2	3
Overstory Fuels	1	2	3
Toward HRV	1	2	3
Insect and disease (endemic) current	1	2	3
Epidemic I&D potential	1	2	3
Fire, disease intolerant species	1	2	3
Planting Rust Resistant Western White Pine	0	2	3
Aspen Restoration	1	2	3
TOTAL POINTS	9	21	29

Alternative G best achieves the silvicultural objectives because it treats the highest number of acres for restoration to Historical Range of Variability and for management of insect and disease outbreaks. Comparatively, Alternative G treats 30 percent more acres of high and medium priority stands, as well as more acres of these stand within the wildland urban interface than Alternative E. Alternative G also does a better job of reducing the risk of stand replacement fires and fuel reductions across the watershed than Alternative E.

4.2.2 Sensitive Plants: Effects of the Alternatives

The following analysis is derived from the Sensitive Plant Species Report for the South Deep Management Project and is available for review in the analyses file at the Three Rivers Ranger District office.

Alternative A – No Action

Direct and Indirect Effects

The current conditions of sensitive plants in the analysis area are, in part, the result of fire suppression. Habitats for species that evolved with frequent fire intervals have diminished. Sensitive plants that occupied open stands of ponderosa pine have declined. However, habitats for sensitive plants that evolved in riparian and wetland areas remain mostly unchanged.

In the No Action Alternative A, no timber harvest or fuel reduction actions are proposed. Current activities in the area would continue and natural processes would dominate. Changes in stand condition and/or progression toward old-growth conditions would be slow, and the risk of losing much of this area to stand-replacing wildfire would increase over time.

The effects of Alternative A may impact individual sensitive plants, but are not likely to result in a trend to federal listing or loss of viability of any sensitive plant species.

Cumulative Effects

New allotment management plans in the South Deep watershed are planned to be written, as part of the Aladdin Complex Range Allotment decision (2005). The effects of this project on sensitive plants and mitigation measures are described in the September 24, 2002 Biological Evaluation for Aladdin Complex Range Allotment (USDA FS, 2002b).

The Colville National Forest Land and Resource Plan reduces cumulative effects to sensitive plants across watershed boundaries. Since 1991, a 250-foot no-harvest buffer has been applied to sensitive plant populations found on the Three Rivers Ranger District. Other protection for species associated with riparian, wetland and upland habitat is provided by ecosystem and fish habitat amendments to the Colville National Forest Land and Resource Management Plan. These Forest-wide protections would limit the cumulative effects of ground disturbing activities on sensitive plants and their habitats.

Alternatives E and G

Direct and Indirect Effects

In both action alternatives, activities are proposed that may affect known populations of 11 sensitive plant species: *Antennaria parvifolia*, *Botrychium crenulatum*, *Botrychium hesperium*, *Botrychium paradoxum*, *Botrychium pedunculatum*, *Carex flava*, *Carex saxatilis* var. *major*, *Geum rivale*, *Ophioglossum pusillum*, *Sisyrinchium septentrionale*, and *Viola renifolia*. Negative impacts to these species and their habitats are possible, but would be minimized with the implementation of protective measures. These include implementing “no activity buffers” around the known plant populations in or near commercial harvest units, precommercial harvest units, and road segments to be constructed or reconstructed; and not felling trees or constructing landings in meadows with sensitive plant populations. (These measures are listed in Chapter 2, section 2.4.8 Sensitive Plants.)

For the discussion of effects, sensitive plant species are grouped by general habitat: forested, meadow, and wetland. The effects of the proposed activities with the implementation of the above protective measures are described for each habitat group.

Forested Species

Two sensitive plant species found in forested habitats have been documented in the project area, *Botrychium crenulatum* and *Viola renifolia*. Table 4-17 shows the number of populations potentially affected by proposed activities for each of the action alternatives, E and G.

Table 4-18. Forested Sensitive Plant Populations Potentially Affected by Proposed Activities in Alternatives E and G.

Number of populations within:	<i>Botrychium crenulatum</i>		<i>Viola renifolia</i>	
	E	G	E	G
a harvest unit			1	1
250 feet of a harvest unit	5	6		
a pre-commercial thinning unit	2	2		
250 feet of a pre-commercial thinning	5	5	1	1
a burn unit	2	2		
250 feet of a burn unit	1	1		
a new road		1		
250 feet of a medium reconstruction road	3	3		
0' of a light reconstruction road	1	1		
250 feet of a light reconstruction road	3	4		

In both action alternatives, the proposed harvesting, burning, road construction and reconstruction activities may directly impact known populations of these species, by altering habitat conditions on the forest floor and decreasing overhead shade. Prescribed fires in forested habitats are expected to mimic natural disturbances. These fires do not pose a threat to *Botrychium* species, unless they burn exceptionally hot or occur when the soil is desiccated (Johnson-Groh 1996).

By implementing the protective measures described above, the action alternatives may impact individuals, but are not likely to result in a trend toward federal listing or loss of viability for these species.

Meadow Species

Six sensitive plant species found in meadow habitats are documented from the project area: *Antennaria parvifolia*, *Botrychium hesperium*, *Botrychium paradoxum*, *Botrychium pedunculatum*, *Ophioglossum pusillum*, and *Sisyrinchium septentrionale*. Table 4-19 shows the number of populations potentially affected by proposed activities for both action alternatives.

Table 4-19. Meadow Sensitive Plant Populations Potentially Affected by Proposed Activities in Alternatives E and G.

Number of populations within:	<i>Antennaria parvifolia</i>		<i>Botrychium hesperium</i>		<i>Botrychium paradoxum</i>		<i>Botrychium pedunculatum</i>		<i>Ophioglossum pusillum</i>		<i>Sisyrinchium septentrionale</i>	
	E	G	E	G	E	G	E	G	E	G	E	G
a harvest unit				1				1				
250 feet of a harvest unit	2	2	2	3		1	1	1				
250 feet of a pre-commercial thinning	1	1	1	1			1	1				
a burn unit			1	1	1	1						
200 ft of new road				1				1				
30' of a medium reconstruction road			1	1			2	2	2	2	1	1
250 feet of a medium reconstruction road												
125 feet of a light reconstruction road			1	1			1	1				

In both action alternatives, the proposed activities may directly impact known populations by altering meadow habitat conditions. Prescribed fires in meadow habitats are expected to mimic natural

disturbances. These fires do not pose a threat to *Botrychium* species, unless they burn exceptionally hot or occur when the soil is desiccated (Johnson-Groh 1996).

By implementing the protective measures described above, the action alternatives may impact individuals, but are not likely to result in a trend toward federal listing or loss of viability for these species.

Wetland Species

The number of populations of 4 wetland species, *Carex flava*, *Carex saxatilis* var. major, *Cicuta bulbifera* and *Geum rivale*, which are potentially affected by proposed activities in the action alternatives are shown below in Table 4-20. No timber harvest would occur within 50 feet of wetlands up to one acre in size or within 150 feet of wetlands larger than one acre.

Table 4-20. Wetland Sensitive Plant Populations Potentially Affected by Proposed Activities in Alternatives E and G.

	<i>Carex flava</i>		<i>Carex saxatilis</i> var. major		<i>Cicuta bulbifera</i>		<i>Geum rivale</i>	
Number of populations within:	E	G	E	G	E	G	E	G
a harvest unit	2	2		1				1
250 ft of a harvest unit	2	2					1	1
250 ft of a pre-commercial thinning	2	2					2	2
a burn unit	2	2						
100 ft of a burn unit	1	1						
30 ft of a medium reconstruction road	1	1						
250 ft of a medium reconstruction road	2	2			1	1		
125 ft of a light reconstruction road	1	1						

In both action alternatives, the proposed activities may directly impact known populations by altering wetland habitat conditions. *Carex flava* regenerates through rhizomes and seed germination. Although low- to moderate-severity fire may burn the aerial portions of plants, they should survive by sprouting from the rhizomes. Wet meadows where *Carex flava* occurs have a low intensity and high frequency fire regime. The proposed prescribed burning would mimic these conditions and should not adversely affect plants or their habitat (USDA FS, 2002a).

By implementing the protective measures described above, the action alternatives may impact individuals, but are not likely to result in a trend toward federal listing or loss of viability for these species.

Cumulative Effects

New allotment management plans in the South Deep watershed are planned to be written, as part of the Aladdin Complex Range Allotment decision (2005). The effects of this project on sensitive plants and mitigation measures are described in the September 24, 2002 Biological Evaluation for Aladdin Complex Range Allotment (USDA FS, 2002b).

The Colville National Forest Land and Resource Plan reduces cumulative effects to sensitive plants across watershed boundaries. Since 1991, a 250-foot no-harvest buffer has been applied to sensitive plant populations found on the Three Rivers Ranger District. Other protection for species associated with riparian, wetland and upland habitat is provided by ecosystem and fish habitat amendments to the Colville National Forest Land and Resource Management Plan. These Forest-wide protections, coupled with the project-specific protective measures, would limit the cumulative effects of ground disturbing activities on sensitive plants and their habitats.

4.2.3 Noxious Weeds and Competing Vegetation: Effects of the Alternatives

The following noxious weed analysis is derived from the Noxious Weed Report for the South Deep Management Project and is available for review in the analyses file at the Three Rivers Ranger District office.

Alternative A – No Action

Direct and Indirect Effects

Under Alternative A the rate of increase of noxious weeds invasion would not change due to disturbed soils, because harvest activities and road construction would not take place in the project area.

However, infestation of yellow hawkweeds, which currently occupies sites on 327 acres in the analysis area, is expected to continue at a rate of approximately 8 acres per year. Given the same abilities and available funding, these weeds will likely expand to cover as much as 407 acres in the next 10 years. Little additional increase in the extent of dalmatian toadflax, oxeye daisy, goatweed, Canada thistle, common tansy, and diffuse and spotted knapweeds is expected because these populations are currently manageable with existing efforts and funding.

Cumulative Effects

The following table summarizes the estimated maximum disturbance of soil due to past, present, and reasonably foreseeable activities. There would be no additional disturbance or increase in the extent of noxious weeds because of the No Action alternative.

Table 4-21. Past, Present, and Foreseeable Estimated Maximum Disturbance of Soil Chart

Disturbance Activity	Acres of disturbed soil
Harvest (1,595 acres)	80
Road Maintenance (278 miles)	505
Road Construction/Reconstruction (0 miles)	0
Road Obliteration/decommission/abandonment (0 miles)	0
Burning (0 acres)	0
Grazing (85,602 acres)	2,568
Mining (14 acres borrow sites, 5 acres mines)	19

Alternative E

Direct and Indirect Effects

In the action alternatives harvest activities would create more open stands, which would provide a more favorable environment for noxious weeds, such as knapweed, hawkweeds, hounds tongue, and goatweed. Although most weeds normally do not compete well with native vegetation in shaded environments, thinning treatments will likely not provide enough shade in most areas to deter these weeds' establishment. Therefore, disturbed areas would be at moderate risk for infestation if seed sources for the above weeds are readily available. Timely implementation of mitigation measures is anticipated to reduce this risk to acceptable levels.

Disturbed soil areas following harvest and road-building activities would create a seedbed readily susceptible to noxious weed invasion. In order to minimize the risk of noxious weeds becoming established it is critical that seeding of disturbed sites be accomplished as soon as possible after the activity is complete. Natural hazard-fuels burning activities would also expose mineral soils, but the exposure would be widely scattered, the areas of bare soil would be small in size, and re-colonization by native plants would occur rapidly.

There would be 559 acres of disturbed soil available for invasion by noxious weeds or an additional 11.1% of the planning area (50,192 acres). Table 4-22 summarizes the causes of this soil disturbance.

Table⁵ 4-22. Estimated Maximum Disturbance of Soil

Tractor Harvest 3,253 acres	163 acres
Skyline Harvest and Helicopter 617 + 736 acres	27
Road Construction & Reconstruction 74.5 miles	217
Road Obliteration/Decommissioning/Abandonment 2.4 miles	7
Natural Fuels, controlled burning 0 Acres	0
Prescribed burning 4,606 acres	138 acres
Borrow sites	7 acres

*The amount of road that is actually disturbed is dependent upon current conditions on the ground and could vary from 5% to 15%. An average value of 10% of the road length was determined to be appropriate based on field review of past projects. Soil disturbance as a result of grazing activities is based upon soil effects analysis on range projects. Considering water developments, trails, salting areas, and corrals, disturbance ranged between 1% and 3%.

In addition to the area in Alternative A, there would be 16 acres of plumeless thistle, 74 acres of yellow hawkweeds, and 20 acres of knapweeds disturbed by road construction/re-construction. An additional 6 acres of plumeless thistle, 32 acres of yellow hawkweeds, and 18 acres of knapweeds would be disturbed by timber harvest activities. The increase in extent of these noxious weeds population would be dependent upon the timing of the disturbance. Plumeless thistle does not increase when not in bloom and hawkweeds increases somewhat, but both weeds would substantially increase if disturbed during the flowering season. Knapweeds could increase by as much as 27% per year if disturbed while in bloom or if seeds are dispersed by equipment. During the life of the project (5 years), this would represent 89 acres or 1.8% of the planning area.

The effects to dalmatian toadflax, oxeye daisy, goatweed, Canada thistle, or common tansy would be the same as Alternative A.

Alternative G

Direct and Indirect Effects

Under Alternative G, 755 acres of disturbed soil (or an additional 15.0% of the planning area) would be available for invasion by noxious weeds. Table 4-23 below summarizes the causes for this soil disturbance.

⁵ Source: *Method for Evaluating Soil Disturbance for Various Timber Harvest Alternatives*, by Duane Dipert, Soil Scientist, Colville National Forest, 1990.

Table 4-23. Estimated Maximum Disturbance of Soil

Disturbance Activity	Acres of disturbed soil
Tractor Harvest 5,215 Acres	261
Skyline Harvest 1,011 Acres and Helicopter 889 Acres	38
Road Construction & Reconstruction miles 78.7 Miles	229
Road Obliteration/decommission/abandonment 2.4 miles	7
Natural Fuels, controlled burning 0 Acres	0
Prescribed burning (Slash and Mechanical) 7,115 Acres	213
Borrow sites	7

In addition to the area in Alternative A, there would be 100 acres of plumeless thistle, 88 acres of yellow hawkweeds, and 21 acres of knapweeds disturbed by road construction/re-construction. An additional 12 acres of plumeless thistle, 47 acres of yellow hawkweeds, and 18 acres of knapweeds would be disturbed by timber harvest activities. The increase in extent of these noxious weeds population would be dependent upon the timing of the disturbance. Plumeless thistle does not increase when not in bloom and hawkweeds increases somewhat, but both weeds would substantially increase if disturbed during the flowering season. The effects would be greater than under Alternative E (only slightly more so for hawkweeds) due to greater disturbance of soil. Knapweeds could increase by as much as 27% per year if disturbed while in bloom or if seeds are dispersed by equipment. During the life of the project (5 years), this would represent 92 acres or 1.7% of the planning area.

The effects to dalmatian toadflax, oxeye daisy, goatweed, Canada thistle, or common tansy would be the same as Alternative A.

Cumulative Effects of Action Alternatives

There have been and will continue to be in the foreseeable future: harvest activities, livestock use, prescribed burning, wildfires, noxious weed treatment, road decommissioning, road maintenance, and mining.

Noxious weeds would also continue to increase with recreational use, including firewood gatherers, driving for pleasure, hunting, OHV users, and berry pickers. OHV trails would likely increase in the area under new policies, which would substantially increase chance of noxious weed invasion. Current weed populations would also increase following wildfires and subsequent suppression activities.

Table 4-24. Estimated Additional Disturbance

Disturbance Activity	Alternative E	Alternative G
Harvest	11%	15%
Road Maintenance	0%	0%
Road Construction/Reconstruction	0%	100%
Road Obliteration/decommission/abandonment	41%	41%
Burning	100%	100%
Grazing	0%	0%
Mining	26%	26%

Effects Summary

The following table summarizes the estimated increase in weed populations due to the effects of the alternatives.

Table 4-25. Alternative Comparison

Alternative	Change in Extent	Acres of disturbed soil	Additional soil disturbance	Additional increase in extent of noxious weeds
Alternative A/No Action	0	0	0%	0%
Alternative E	209	559	15%	28%
Alternative G	260	755	19%	32%

4.2.4 Threatened and Endangered Species: Effects of the Alternatives

Threatened, endangered and sensitive species effects analyses are based on the South Deep Watershed area which includes the planning area. For some species, cumulative effect analysis may also consider the effects from activities over a larger area. The following analysis is derived from the Threatened, Endangered, and Sensitive Species Report for the South Deep Management Project and is available for review in the analyses file at the Three Rivers Ranger District office.

Bald Eagle (*Haliaeetus leucocephalus*)

Status: Threatened-Federal

Alternative A – No Action

Direct, Indirect, and Cumulative Effects and Risk Assessment

The “no action” alternative will not affect potential bald eagle nests and winter roost sites, and therefore, will not affect bald eagles directly, indirectly, or cumulatively.

Alternative E and Alternative G

Direct and Indirect Effects

Alternatives E and G will not affect existing nesting trees because no nests occur in the watershed. However, portions of units ECB, DCH, ECG, DCI, ECJ in both alternatives lie within 2,000 feet of Big Meadow Lake (Table 4-26), which is potential nesting habitat. A 2000 foot buffer around the lake contains about 830 acres so about 16% of this area would be affected by harvest. Because all live trees greater than 21 inches in diameter at breast height will be retained and the harvest prescription in all units will retain the majority of the canopy, neither action alternative would negatively affect potential nest trees. Intensity of harvest in Unit ECB would open the stand considerably, but thinning will increase growth rates of remaining trees and increase the area's number of potential nest trees faster than with no harvest. The Forest Service will continue to monitor bald eagle activity and if birds nest near the lake, timing restrictions will be implemented to reduce or eliminate conflicts with bald eagles.

Table 4-26. Units That Lie Entirely or Partially Within 2000 feet of Big Meadow Lake.

Unit	Alternative	Acres of unit within 2,000 feet of Big Meadow Lake
DCH	E, G	13
DCI	E, G	26
ECB	E, G	26
ECG	E, G	43
ECJ	E, G	22

Fuels reduction, precommercial thinning, and road closures would have no effect on potential nesting habitat.

Both action alternatives would affect some potential roost trees by harvesting in all or portions of 26 units in Alternative G and 23 units in Alternative E. Harvest prescriptions in 9 units in Alternative G and 8 units in Alternative E might reduce the canopy to the level that would preclude use by bald eagles. Trees in only 2 of these units have reached sizes greater than 20 inches in diameter at breast height, which are the tree sizes that bald eagles typically use for roosting. The harvest prescriptions of all units would retain the 8 largest live trees per acre, and any live trees greater than 21 inches in diameter at breast height. Therefore, neither action alternative would negatively affect the quality of the whole area as winter roosting habitat. The loss of some roost trees would not preclude eagles from roosting in the area.

Fuels reduction, precommercial thinning, and road closures would not affect potential roosting habitat.

Cumulative Effects

The area considered for cumulative effects analysis consists of the entire district. No current or proposed sales would affect existing nest trees because only one nest exists on the district and it is not in an area slated for timber harvest. While all current or proposed sales would affect large trees that have the potential to serve as roost trees, all South Deep harvest units lie several miles from the large concentrations of eagles along Lake Roosevelt. However, individual trees that could support small groups of foraging eagles would be affected.

Risk Assessment

Alternative A will not affect bald eagles. Alternatives E and G "may affect but are not likely to adversely affect" either nesting bald eagles or wintering bald eagles roost sites. Both action alternatives propose to harvest the same acreage around Big Meadow Lake and both propose to harvest the same units in potential roosting habitat. None of the fuels reduction or precommercial thinning units, or road closures would create either a positive or negative effect to bald eagle habitat because they will not affect potential habitat components.

The likelihood of negative effects is low because bald eagles do not nest and wintering eagles do not congregate at roost sites in the watershed, although individual wintering bald eagles probably infrequently roost near the agricultural land in the valley of the watershed. The consequence of negative effects is also low because bald eagles are continuing to increase their population in the area and sufficient habitat remains adjacent to harvest units to provide nesting and winter roosting habitat. Finally, the harvest prescriptions intend to improve growth of residual trees, thus over time will provide larger trees for potential nesting or roosting.

Grizzly bear (*Ursus arctos*)

Status: Threatened – Federal

Alternative A – No Action

Direct and Indirect Effects

Alternative A will not affect grizzly bears either positively or negatively.

Alternative E and Alternative G

Direct and Indirect Effects

Alternative E has no effect on secluded habitat, the fewest potential negative effects (minor reduction of some corridors that will not preclude bears from using them) and moderate positive effects (improved forage conditions on winter range and enhancement of berry patches by opening the canopy of stands at mid and higher elevations via harvest and precommercial thinning).

In contrast, Alternative G has a minor negative effect to secluded habitat outside of core area habitat (road construction in the Mt. Rogers/Rogers Mt. area), minor, negative effects to travel corridors (harvest will reduce size of some corridors but not eliminate their potential for use). However, because it harvests more acres of timber, it provides the greatest improvement to forage conditions on winter range and enhancement of berry patches by opening the canopy.

Forage

No units were designed to improve forage for bears, though all harvest will stimulate some forage. Underburning in the lower elevations and post-harvest underburning in several of the harvest units might improve berry fields. Both alternatives will increase the amount of forage, with Alternative G improving nearly 1 ½ times area as much area as Alternative E (about 7100 acres vs. about 4600 acres).

Precommercial thinning has the potential to increase forage by reducing tree competition with berry-producing shrubs. Both action alternatives propose the same amount of precommercial thinning.

The discussion under “gray wolf” outlines the effects of each alternative to big game. Briefly, in both alternatives, proposed harvest in existing poor cover will improve long-term winter cover for deer. Alternative E moves the cover:forage ratio near the 50:50 considered optimum. Alternative G, with its higher harvest levels and larger created opening sizes, has the potential to affect more acres of existing cover and could result in shifting the cover:forage ratio further from the desired 50:50 ratio than Alternative E. Post-harvest prescribed fire will improve forage on nearly 150 acres. For summer range, all of the action alternatives improve the cover:forage ratio, moving it closer to the 50:50 considered optimum.

Under Alternative G, timber harvest and new road construction would increase the risk of noxious weed invasion, which would reduce the amount of palatable forage, but negative effects of noxious weed encroachment in both alternatives would be partially mitigated by treating haul routes before hauling.

Travel Corridors and Hiding Cover

Both action alternatives have the same effects on riparian corridors: harvest will not restrict any riparian corridor to less than 400 feet wide and will not prevent grizzly bears from using these areas.

Regeneration harvest during the early 1990s’ Polly Cabin timber sale created several openings and young trees have grown to where many provide sufficient cover for corridors. Alternative E does not propose harvest in this area, and therefore, would not affect animal movement. In Alternative G, proposed harvest in Unit DFG and precommercial thinning in unit TBU has the potential to hinder animals

from moving through this area, but we will retain a forested corridor on the western part of unit TBU. Both action alternatives would create more openings in the landscape than currently exist. Alternative E would eliminate the least amount of hiding cover (about 1,100 acres in 43 units) and Alternative G would eliminate the most (more than 2 ½ times as much as Alternative E: about 3,000 acres in 84 units).

Timber harvest along the Seldom Seen Mountain/Aladdin Mountain ridgeline also has the potential to restrict a corridor if Alternative G is implemented. Parts of Unit ECV, ECK, DCK and DGF lie on or near the ridgeline. Alternative E proposes to harvest only Unit ECV and would not affect this corridor. Harvest in Alternative G, coupled with the natural opening just west of Unit DCK would not eliminate the corridor but a bear moving along the ridgeline would face an opening in the corridor nearly ¾ of a mile wide created by past harvest, natural openings, and harvest from this project.

Proposed harvest along a ridgeline in the Lone Hill area could affect grizzly bear movement, but not to the extent of the previous two areas. Units NBK, NBM, NBN and NBO in both action alternatives are proposed for more intense harvest than adjacent units, and depending on the intensity and location of harvest could eliminate sections of the ridgeline corridor. This corridor isn't as important because a riparian corridor along Meadow Creek lies within ½ mile of the ridge. Precommercial thinning units TAV, TAZ, TBE along Meadow Creek will retain sufficient cover to maintain the area as a corridor. No road construction will affect either the ridgeline or the Meadow Creek corridor, and the 1700-100 and 1700-150 road segments that cross Meadow Creek will be closed.

In addition, Alternative G proposes construction of 3 road segments across riparian areas of small, class 4 streams that bears might use to move within the watershed. Sufficient cover would remain along these streams. So, the proposed roads would not likely preclude bears from using the area. None of the proposed roads crosses a ridgetop or saddle. The Forest Service would mitigate the effects to grizzly bears of new roads that cross riparian areas by pulling slash and debris over them when they are closed. Therefore, none of the roads would negatively affect potential corridors or grizzly bear movement.

Both action alternatives would create more openings in the landscape than currently exist. Alternative E would eliminate the least amount of hiding cover (about 1,100 acres in 43 units) and Alternative G would eliminate the most (more than 2 ½ times as much as Alternative E: about 3,000 acres in 84 units).

The loss of hiding cover along roads is an important consideration because bears are most susceptible to being poached near roads; and the further a poacher can see into a unit that might contain a bear, the greater the chance of the bear being killed. Alternative G proposes 79 units that would eliminate hiding cover along roads, and Alternative E proposes 40 units. While the loss of hiding cover would not directly keep bears from using an area, the loss might increase the poaching potential. Precommercial thinning units along open roads will retain a no-thin strip.

Core Area/Secluded Habitat

Both harvest units and roads can affect secluded habitat. The effects of units relate to the timing of harvest and the length of management activities. Proposed units would affect core area habitat only during the period that harvest and post-harvest activities take place. Units SDR and SDS in both Alternatives E and G affect about 20 acres of the core area that lies in the southeastern part of the watershed.

Roads will not be built into any core area so, as mentioned above, the negative effects to core area would occur during harvest activities and would last less than a few months.

A potential negative effect outside of a core area is due to road construction and reconstruction in the area of Mount Rogers and Rogers Mountain, near where grizzly bears have been seen. However, all roads currently closed and all new road construction would be closed after timber harvest activities, and therefore, there would be no negative effects.

After harvest and post-harvest activities, the Forest Service will close all new roads and roads currently closed that were opened and reconstructed for the project. We recognize that road closures are not 100% effective. Roads will be closed when post-harvest activities have been completed, within 6 years after project activities will start. Closing roads will result in a maximum of about 13.5 square miles of secluded habitat in 4 large blocks. The increase in secluded habitat will benefit grizzly bears, though still

probably isn't sufficient for bears to reside in the area. The result will be the same for both action alternatives.

Loss of habitat due to noxious weed invasions can be decreased by pre-harvest techniques such as controlling noxious weeds on existing haul roads in the watershed starting a few years before harvest activities, and re-seeding roads with species that will aggressively compete with noxious weeds when the roads are built (D. Fagerlie, pers. comm.). Noxious weeds were raised as an issue during scoping, and will noxious weeds will be treated the same in all alternatives: all haul routes will be treated for noxious weeds before haul.

Non-motorized recreational use (hiking and mountain bike riding) currently occurs at low levels in this area, though the area is heavily hunted for big game, forest grouse and turkey.

Cumulative Effects

The area considered for cumulative effects consists of the eastern portion of the Three Rivers Ranger District. Quartzite is the only planned, uncompleted Forest Service timber sale project, but precommercial thinning units are scattered throughout the area. Completed projects include Backlakes, Addy-Chewelah (various sales), M. F. Mill, Millstream, Twigs, Dominion, Hudson, Stoney, United Eagle, 49 Degrees North, Rocky, Aladdin Blowdown, Bestrom, Butte Creek Riparian, Divine, Flowery Trail, Frater, Hande Creek, Holford, Hosmer, Hound, Longshot, Master Deluxe, Meadows, Middleport, MF Mill Cr. Riparian, Mitchell Meadows, No Smacks, Quark, Riddy Salvage, Rocky Creek Riparian, and Six Bits. There are also treatments on other ownerships within the Forest boundary. Planned and completed projects have both positively and negatively affected grizzly bear habitat. Habitat enhancement came via harvest that improved forage and cover. Habitat quality reduction resulted from roading and concomitant activities that introduced or spread noxious weeds, and fire suppression that reduced forage.

Some bears known to have been on the District have subsequently been illegally killed, though not on the District. The main threat to bears comes not from timber harvest or activities associated with it, but from humans. Timber harvest can be compatible with grizzly bear management because it increases forage, primarily berries. Road construction can also be compatible if roads are effectively closed to vehicles. Future projects in the watershed include more prescribed fire along the private land boundaries at lower elevations. Existing and future projects on the District will be planned to be compatible with management for grizzly bears in Management Situation 5.

Forage

No units in any project were designed to improve forage for bears, though all harvests will increase available forage. Continued encroachment of noxious weeds will reduce palatable vegetation. Management of wildland/urban interface areas, usually at lower elevations and rarely in riparian areas, will have a minor positive effect to forage conditions.

Hiding Cover

Hiding cover throughout the District will probably not decrease significantly because recent trends in the Forest Service indicate that the agency will propose fewer large regeneration units and instead move to create pockets of smaller openings. Additionally, many regeneration harvest units cut in the 1980s and early 1990s have nearly grown into hiding cover and, depending on the level of precommercial thinning in these units, can provide good hiding cover adjacent to foraging patches.

Travel Corridors

The Forest Service has adopted guidelines to maintain travel corridors. All current and future projects will retain at least 400-foot widths for corridors. Though decreasing corridor width might affect grizzly bear movement patterns in the short-term, sufficient corridor habitat should remain to allow bears to move through an area.

Road Density and Core Area/Secluded Habitat

Reductions in core area habitat decreases habitat suitability for grizzly bears, mainly because the greatest threat to bears is that of being shot by a poacher. Current and future projects that construct or reopen roads will reduce core area habitat.

The Forest Plan requires that new roads be closed at the end of harvest activities, so the most severe negative impacts would be limited to the time during which the roads remain open to vehicle traffic, usually a 3-to-6 year period. While restricting some vehicles, closed roads often still allow access by OHVs riders, so nearly all closed roads reduce the amount of core area habitat until the road becomes too grown-over for vehicles to pass. Considering the number of bears that might use the District, the scattered level of harvest and post-harvest activity, and the reduced level of road building than in the past, future projects probably will not result in a loss of core area habitat.

Risk Assessment

Alternative A will have no effect on grizzly bears. Alternatives E and G may affect but are not likely to adversely affect grizzly bears or grizzly bear habitat. Both Alternatives E and G have insignificant effects to core area habitat and minor negative effects to travel corridors. Alternative E has moderate positive effects due to improved forage conditions. Alternative G has minor negative effects to secluded habitat, but provides the greatest improvement in forage conditions.

Both action alternatives have moderate likelihood of adverse effects because bears sometimes use the watershed. Without the adjustments to areas that affect corridors, Alternatives E and G will have moderate negative consequences. Because of planned modifications, both action alternatives will have low consequences.

Woodland caribou (*Rangifer tarandus*)

Status: Endangered-Federal

Direct, Indirect, and Cumulative Effects and Risk Assessment

The woodland caribou is being managed under a recovery plan approved by the U.S. Fish and Wildlife Service in 1993 (USFWS 1993b). The only recovery area identified in the State of Washington is east of the Pend Oreille River in the northeast corner of the Selkirk Ecosystem. At present, woodland caribou within the Selkirk Ecosystem exist only in the extreme northeastern corner of the state, separated from the watershed by the Pend Oreille River and the east side of the mountains between the watershed and the river. All alternatives are expected to have "no effect" to woodland caribou. There are no cumulative effects to woodland caribou because no other projects on the district would affect them.

Gray wolf (*Canis lupus*)

Status: Endangered-Federal

The effects of planned activities on potential wolf habitat was assessed because wolves have been reported nearby and wolves may occupy the area. The Forest Service makes provisions to protect individual animals and/or essential habitats, such as denning or rendezvous sites, outside recovery zones in timber contract clause CT6.25, Protection of Habitat of Endangered, Threatened and Sensitive Species, a part of all timber sale contracts on the Colville National Forest. This clause calls for protection of any essential habitat components discovered during construction and harvest activities related to these projects.

Alternative A – No Action

Direct, Indirect, and Cumulative Effects and Risk Assessment

This alternative will not improve the cover:forage ratio and will continue the decline in forage conditions for ungulates, but Alternative A is not expected to affect wolves either positively or negatively.

Alternative E and Alternative G

Direct and Indirect Effects

Ungulate Prey Base

Commercial harvest will improve forage quality in the short-term and cover quality in the long-term. Depending on the intensity of the harvest, the time to reach improved cover quality will vary.

Both action alternatives break up large blocks of cover and improve distribution of cover and forage, relative to the needs of big game. Considering the historical range of variability for habitat patches, positive effects to distribution will be minimal. Under Alternative E, a total of 797 acres of thinning, shelterwood, overstory removal, and clearcut with reserve tree treatments are prescribed. These treatments would reduce most of the existing over-abundance of cover and, assuming the resulting stands could be classified as forage, would result in a cover:forage ratio of approximately 49: 51. This would move the winter range within the project area more in line with Forest Plan objectives.

Alternative G moves the cover:forage in winter range to a condition more open than the optimal 50:50. A total of 969 acres would be treated with harvest prescriptions that could potentially affect existing cover, resulting in a cover:forage ratio (using the same assumptions presented for Alternative E) of approximately 44:56.

Alternative E proposes no new roads in winter range, while Alternative G proposes about 0.5 miles of new road construction in winter range. However, these roads would be closed at the end of harvest activities. Closing these and other roads will reduce but not eliminate their negative effects as corridors for noxious weed movement. As road density increases, it is more likely that more noxious weeds will become established in unroaded or sparsely roaded areas reducing forage for ungulates, and thus negatively affecting wolves.

The greatest impacts from new roads will be in areas that currently do not contain roads. The greatest indirect effects are the potential for noxious weeds to encroach (indirect loss of habitat), vehicle traffic to increase (noxious weed vector, poaching potential, and disturbance), and cattle to move in to areas that they previously did not access (noxious weed vector and competition for forage). Alternative G proposes about 4.9 miles of new road construction and Alternative E does not propose any.

Denning and Rendezvous Sites

No denning or rendezvous sites were found during nearly six years of field reconnaissance. Because wolves den in a variety of habitats, no attempt was made to identify potential denning and rendezvous sites. The South Deep Project is not expected to have any effect on opportunities for wolves to den or maintain rendezvous sites in the analysis area.

Road Density and Core Area/Seclusion Habitat

Wolves and grizzly bears seem to respond to disturbance in a similar fashion (a major factor in adult mortality is being shot), so the same evaluation criteria was used for both.

Briefly, roads will not be built into any core area so, the negative effects to core area would occur during harvest activities and would last less than a few months and the effects would be minimal. Alternative G

proposes to close new roads and both Alternatives E and G would close some existing roads, which would increase the amount of secluded habitat.

Cumulative Effects

See “Cumulative Effects” for grizzly bears for list of current and past projects and discussion of core area/seclusion habitat. Planned and completed projects have both positively and negatively affected wolf habitat. Habitat for elk, deer, and moose is enhanced as a result of timber harvest, while habitat quality is reduced as a result of roading and concomitant activities that introduce or spread noxious weeds, and fire suppression that reduces forage for big game. All recently planned projects contain projects that would improve conditions for big game, and therefore will improve habitat for wolves. This trend is expected to continue. Action alternatives often improve the cover:forage ratio and propose underburning that improves forage

Reductions in core area habitat decrease habitat suitability for gray wolves. All current projects construct, reconstruct or reopen roads and reduce core area habitat. Current and future projects that construct, reconstruct or reopen roads would reduce seclusion habitat for the portion of time that the project remains active. The Forest Plan requires that new roads be closed at the end of harvest activities, thus the most severe negative effects should be limited to the time during which the roads remain open to vehicle traffic. This varies among sales, but often a road remains open for about 6 years (the time of construction through treatment, plus a year of post-treatment firewood collection). Closed roads reduce disturbance from humans and improve seclusion habitat, but road closures are not completely effective. Roads built into seclusion habitat would influence human access until the road prism becomes too difficult to navigate. Other areas throughout the eastern part of Three Rivers Ranger District still provide seclusion, including the large Management Area 11 in the northeastern part of the Three Rivers Ranger District.

Risk Assessment

Alternative A will have no effect on wolves. Alternatives E and G may affect but are not likely to adversely affect gray wolves or gray wolf habitat. Both action alternatives propose the same positive effects of closing roads and conducting precommercial thinning in some stands. Alternative E has the least negative effects (no road construction, minor reduction of the width of some corridors, and minor effects to secluded habitat) and moderate positive effects (due to improved forage conditions from harvest, prescribed fire and precommercial thinning). Alternative G has minor negative effects to travel corridors, secluded habitat, and the potential for noxious weed spread and it proposes the greatest improvement to forage conditions.

Both action alternatives have low likelihood of adverse effects because wolves probably do not occupy the watershed. With implementation of measures identified in the section under grizzly bears (slash over closed roads, buffering precommercial thinning units along roads, etc.), both action alternatives have low negative consequences.

Canada lynx (*Lynx canadensis*)

Status: Threatened-Federal

Alternative A – No Action

Direct, Indirect, and Cumulative Effects and Risk Assessment

Alternative A will have no direct, indirect, or cumulative effects on lynx.

Alternative E and Alternative G

Direct and Indirect Effects

Unsuitable Habitat

The amount of unsuitable habitat will not exceed the 30% suggested in the Lynx Conservation Assessment and Strategy in either action alternative. These units will provide future forage habitat, thus benefit lynx in the long term. Both action alternatives create nearly the same amount of unsuitable habitat. See Table 4-27 below.

No new roads would be constructed in lynx habitat so habitat would not be permanently made unsuitable.

Corridor

Harvest prescriptions for the portions of units that lie on or near ridge tops (travel corridors) are designed to maintain corridors. Under both action alternatives, harvest would not occur in riparian buffers, so riparian corridors would remain virtually intact.

Foraging Habitat

High-quality foraging habitat is created by stand-level disturbance via fire or timber harvest. Immediately after the disturbance, the habitat is considered unsuitable. The newly established stand takes about 15-20 years to grow into high-quality forage habitat. Both action alternatives have nearly the same positive effect to future high-quality forage habitat.

No post-and-pole, precommercial thinning, or prescribed fire would occur in lynx habitat. Therefore, current forage habitat created by past harvest would not be affected.

Concentrations of downed wood are important habitats for prey species, as well as denning habitat for lynx (discussed below). Portions of commercial harvest units DBO, DBX, DBY, DCK, DCQ, DCZ, DDH, DDM, DDN, DFB, DFC, DFG, DFM, DFT, DGF, ECK, ECR, ECS, ECV, SDG, SDI, SDN, SDO, SDP, SDQ, SDS, SDT occur within lynx habitat in the Lynx Analysis Unit. Concentrations of downed wood would be retained in these units.

Denning Habitat

Timber harvest would not reduce the amount of potential denning habitat below the minimum of 10% of lynx habitat suggested in the Lynx Conservation Assessment and Strategy. Both action alternatives propose to harvest the same amount of denning habitat: Unit DDH (9 acres), SDO (13 acres), SDS (30 acres) and SDT (3 acres). Concentrations of downed wood would be retained in these units. No fuels reduction projects are proposed in lynx habitat, so the amount of large downed wood would not decline.

The action alternatives would not increase or decrease snowmobile use in lynx habitat, would not construct new roads in lynx habitat, and would close the same number of roads.

Provisions in timber sale contracts would protect known denning sites and protect against any accidental "taking" (as defined in FSM 2670.5) of a lynx during harvest-related activities.

The following table summarizes the lynx habitat types that would occur under existing condition and after implementing the action alternatives.

Table 4-27. Lynx Habitat Types.

Habitat type	Existing	Alt E	Alt G
Denning	11%	10%	10%
Forage*	82%	73%	74%
Unsuitable	7%	17%	16%
Total	100%	100%	100%

*Much of the foraging habitat is marginal.

Cumulative Effects

The area on which we analyzed cumulative effects consists of the lynx analysis units that lie along both sides of the ridge that starts at the Canadian border near Hooknose Ridge and runs south to just past 49-Degrees North Ski Resort, a total of about 172,660 acres.

Future Harvest

In addition to this plan, we have planned and sold timber in several watersheds within the cumulative effects analysis area. All future harvest activities would be planned using the Lynx Conservation Assessment and Strategy as the best available science, thus would not negatively affect lynx.

Unsuitable Habitat

The amount of unsuitable habitat should decrease, which should have a minor positive effect to lynx in the short-term but could be detrimental to lynx in the long term. In parts of the district that fall below historical conditions for late and old structure, regeneration harvests will be limited and little unsuitable habitat will be created. Current unsuitable habitat will decrease because many regeneration harvest units cut in the 1980s and early 1990s will grow into at least poor forage cover.

Foraging Habitat

Within the next 5 to 10 years, most of the areas currently classified as unsuitable habitat (mainly past harvest units) will grow into (at least) low-quality forage habitat. Cattle graze within these stands and reduce forage available to snowshoe hare, thus reduce the quality of the foraging habitat. Precommercial thinning will not occur in these stands, which will retain their quality as foraging habitat.

Denning Habitat

Denning habitat will continue to be in relatively short supply not because of lack of overstory but because of low amounts of down wood. No concentration of beetles currently exist in lodgepole pine stands in the cumulative effects analysis area, but some beetle-induced mortality in lodgepole will create structure for new denning cover. Blowdown and breakage caused by ice storms will continue to create some denning cover.

Travel Corridors

Current and future projects will retain existing corridors widths of at least 400 feet wide, thus should retain their utility to lynx.

Road Density

Nearly all current sales temporarily increase road density. The new roads probably will not negatively affect lynx movements during the period in which they are open, about 3 to 6 years (Ruggiero et al. 1999). They could negatively affect lynx because noxious weeds will follow the soil along the road corridors and cause loss of snowshoe hare habitat. Most of the noxious weed species that currently infest the area do not grow well in the cooler, moister habitats that lynx occupy. Orange hawkweed does grow in moister habitats and is spreading. Although the loss of habitat due to noxious weeds will occur, the extent of the effects on snowshoe hare, and thus lynx, is not known.

Risk Assessment

Both action alternatives "may affect but are not likely to adversely affect" lynx. The likelihood of adverse effects is "low" because both alternatives used the best available science to eliminate potential negative effects. No new roads would be constructed in lynx habitat, and no precommercial thinning or fuel

reduction units occur in lynx habitat. Both action alternatives propose to harvest the same amount of denning habitat, create nearly the same amount of unsuitable habitat, and have nearly the same effect to future good forage habitat.

The consequence of adverse effects for both action alternatives is "low" because lynx probably do not occupy the planning area.

Bull Trout (*Salvelinus confluentis*)

Status: Threatened-Federal

Direct, Indirect, and Cumulative Effects and Risk Assessment

There is no historical documentation of bull trout in the Deep Creek watershed. A natural blockage to fish passage exists in the form of vertical falls approximately 3 miles from the mouth of Deep Creek. The watershed, above the falls, is not considered by the US Fish and Wildlife Service to be part of the historical range of the bull trout or part of any recovery area for this species (personal communication with Bob Hallock, USFWS). Therefore, all alternatives are expected to have "no effect" directly, indirectly or cumulatively on bull trout within these 6th field watersheds.

In addition, the proposed actions of timber harvest, fuels reduction, and road construction are not anticipated to have an effect to any bull trout in Lake Roosevelt. The effects of any cumulative increase in sediment input into streams from activities in any of these 6th field subwatersheds to fish and fish habitat in the reservoir would be insignificant and immeasurable due to the size of the reservoir (150 miles in length) and the scattered distribution of individual bull trout within the reservoir. Therefore, all alternatives considered in the South Deep Project are expected to have "no effect" on bull trout and their habitat in Lake Roosevelt.

4.2.5 Forest Service Sensitive Species: Affected Environment

The following analysis is derived from the Threatened, Endangered, and Sensitive Species Report for the South Deep Management Project and is available for review in the analyses file at the Three Rivers Ranger District office.

Common Loon (*Gavia immer*)

Status: R-6 Sensitive

Direct, Indirect, and Cumulative Effects

All alternatives will have "no impact" to loons or their habitat. Although, both action alternatives propose harvest activity near Big Meadow Lake, no unit would enter the wetland area adjacent to the lake, so there would be no direct negative effects to loons or loon habitat. This project would not result in fluctuating water levels because a spillway controls the level of the lake. Human disturbance would not affect loons on the lake because no associated activity would increase human use of the lake. Because this project does not affect loons or loon habitat, it will not contribute to cumulative effects to loons.

Wolverine (*Gulo gulo*)

Status: Sensitive (USFS Region 6 List)

Alternative A – No Action

Direct and Indirect Effects

Alternative A, the no-action alternative, would not change conditions of successional stages, would retain the abundance of small diameter stands, and would retain these stands' susceptibility to a large insect outbreak. For more detail, see Effects to Corridors under the grizzly bear section

The existing cover:forage ratio of 70:30 within designated winter range (MA-6 and MA-8) does not currently meet Forest Plan expectations. No progress toward meeting the desired objective is provided under Alternative A, the No Action alternative. The No Action alternative also places the project area at greater risk for large scale disturbances (insects, disease or wildfire) that could negatively affect game (prey species) by eliminating cover availability for many years.

No denning habitat exists in the watershed, so denning areas would not be affected.

Alternative E and Alternative G

Direct and Indirect Effects

Successional Stages

Nearly all proposed harvest activities were designed to allow trees in stands to more quickly grow to larger sizes, thus move blocks of habitat more closely in line with historical conditions. This should benefit wolverine by providing a variety of habitat types and amounts similar to historical conditions. Alternative G proposes more harvest, so begins to move more area towards historical conditions than Alternative E.

Corridors

For more detail, see *Corridors* under the **grizzly bear** section. Briefly, Alternative E does not propose any road construction. New roads proposed in Alternative G would not preclude wolverine from using areas, and the Forest Service would mitigate the effects of new roads by pulling slash and debris over them when they are closed. Therefore, none of the roads would negatively affect potential corridors. Harvest would not restrict any riparian corridor to less than 400 feet wide and would not prevent wolverines from using these areas.

Prey Species

The existing cover:forage ratio of 70:30 within designated winter range (MA-6 and MA-8) does not currently meet Forest Plan expectations. Both action alternatives reduce the over-abundance of cover and should provide additional forage opportunities to move toward the desired 50:50 ratio. Alternative E is expected to move this area closer to the desired cover:forage ratio than Alternative G.

Prescribed burning activities under both action alternatives are expected to improve existing forage quality and quantity within treatment areas.

Core Area/Seclusion Habitat

For a detailed discussion, see Effects to Core Area/Seclusion Habitat under **grizzly bears**. Briefly, two proposed units (Units SDR and SDS in both Alternatives E and G) totaling about 20 acres would affect

core area habitat only during the period that harvest and post-harvest activities take place (less than a few months), and would not negatively affect wolverines.

Denning Areas

No denning habitat exists in the watershed, so denning areas will not be affected.

Cumulative Effects

The area considered for cumulative effects analysis consists of the east portion of the Three Rivers Ranger District. Planned Forest Service projects include Quartzite, Backlakes, Addy-Chewelah (various sales), M. F. Mill, Millstream, Twigs, Dominion, Hudson, Stoney, United Eagle, 49 Degrees North and Rocky and completed projects in Aladdin Blowdown, Bestrom, Butte Creek Riparian, Divine, Flowery Trail, Frater, Hande Creek, Holford, Hosmer, Hound, Longshot, Master Deluxe, Meadows, Middleport, MF Mill Cr. Riparian, Mitchell Meadows, No Smacks, Quark, Riddy Salvage, Rocky Creek Riparian, and Six Bits. Additionally, other ownerships within the Forest boundary have planned and implemented projects. Planned and completed projects will affect or have affected wolverine habitat. Activities have modified habitat (timber harvest, prescribed fire) and increased both road densities and human presence. Recreational access/use also potentially affect wolverine habitat. The forest has winter and other seasonal use trails throughout the eastern (Colville) portion of the district.

Successional Stages

All recent sales were planned using the concept of managing towards historical ranges of variability for different structural stages, which should maintain successional patterns and processes similar to those with which wolverine evolved. Continued management under this scenario should benefit wolverine.

Travel Corridors

The Forest Service adopted guidelines to maintain corridors to connect late and old structural stands. All current and future projects will retain these corridors. Though decreasing width of these corridors might affect wolverine movement patterns, the corridors will provide sufficient habitat to allow wolverine to move through an area. The Forest Service does not have guidelines to maintain cover on major ridges and saddles. Harvest on major ridges and saddles will restrict but not prevent movement of wolverine.

Prey Summer and Winter Range

All recently planned projects contain projects that will improve conditions for big game, thus wolverine. This trend will continue. Much of big game winter range lies within the wildland/urban interface, and fuels reduction projects that include prescribed fire and opening the canopy will improve forage conditions for big game, thus wolverine. Other planned prescribed fire and harvest in winter range will improve conditions for big game in the Quartzite and United Eagle projects in the Quartzite watershed. Wildlife underburns have also been conducted in the southern part of Quartzite (Woodward, Wessendorf/Cottonwood) and have improved ungulate forage. The South Deep action alternatives would improve the cover:forage ratio and propose underburning that would improve forage. These projects will benefit big game, thus wolverine.

Noxious weeds have severely impacted big game habitat throughout the West, whether or not harvest activity has taken place, which decreases and in many cases offsets the improved forage conditions that result from opening the canopy. The level of forage reduction and consequent reduction in big game populations is not known. Along road corridors, spraying and use of integrated pest management for noxious weeds might limit, but will not entirely prevent their spread.

Core Area/Seclusion Habitat

Many projects have reduced seclusion habitat, thus decreased habitat quality for wolverine. Current and future projects that construct, reconstruct or reopen roads will reduce seclusion habitat for the portion of time that the project remains active. The Forest Plan requires that new roads be closed at the end of harvest activities, thus the most severe negative effects should be limited to the time during which the roads remain open to vehicle traffic. This varies among sales, but often a road remains open for about 6 years (the time of construction through treatment, plus a year of post-treatment firewood collection). Closed roads reduce disturbance from humans and improve seclusion habitat, but road closures are not completely effective. Roads built into seclusion habitat will influence human access until the road prism becomes too difficult to navigate. Other areas throughout the eastern part of Three Rivers Ranger District still provide seclusion, including the large Management Area 11 in the northeastern part of the Three Rivers Ranger District.

Denning Areas

Few potential natal denning areas occur, and those that do lie in MA11, which does not allow motorized vehicle traffic. These areas also do not receive much use by back-country skiers during the spring. Minimal to no cumulative effects are expected to potential denning areas.

Risk Assessment

Structural stage distribution will change most with Alternative G, which begins to move more habitat towards late and older structure than Alternative E. Both action alternatives have the same effect to the biologically insignificant amount of seclusion habitat that remains and will only affect it during the time of timber harvest so will not negatively affect wolverine. For prey habitat, Alternative E is expected to move the area closer to the desired cover:forage ratio than Alternative G. None of the alternatives will affect denning areas because that habitat does not exist in the project area.

Both action alternatives “may affect” individual wolverine, but “will not lead in a trend towards federal listing or loss of viability.”

Pacific Western (Townsend's) Big-eared Bat (*Corynorhinus townsendii*)

Status: Sensitive (USFS Region 6 List)

Alternative A – No Action

Direct, Indirect, and Cumulative Effects

The No Action Alternative is expected to have “no impact” to Pacific western big-eared bats directly, indirectly, or cumulatively.

Alternative E and Alternative G

Direct and Indirect Effects

No proposed harvest or precommercial thinning units will directly affect two mines where big-eared bats were located in the past. Harvest units in both alternatives lie close to the adits, but will be buffered by about 400 feet (120 m) to reduce or eliminate potential changes to exterior microclimates that could cause temperature or humidity changes within the mines. This buffer distance was chosen because

temperature and humidity in dead-end adits are not as susceptible to changes in exterior microclimates as are sites that lie in a drainage or contain multiple openings (thus allowing air flow through the mine).

Fuels treatment in Unit ZU is proposed to take place around one of the mine locations. Prescribed fire will be timed to avoid roosting or hibernating bats. Prescribed fire will not affect much of the overstory, thus will not affect the microclimate within the buffer around the adits.

If the bats use the sites as a summer or temporary roost they usually adjust their behavior to avoid humans (P. Ormsbee, pers. comm.). The threat at summer roosts is from people killing the bats.

Timber haul routes on open roads will pass within 115 feet of one adit. Harvest occurs during the summer and early autumn and thus will not affect the adits' capabilities to serve as hibernating habitat.

Cumulative Effects

The area considered for cumulative effects analysis consists of the east side of the Three Rivers Ranger District. Planned projects and treatments on other ownerships within the Forest boundary could contribute to cumulative effects because private landowners are not required to manage for these bats.

Forest Service timber treatments in this and other projects probably will not negatively contribute to cumulative effects to either hibernacula or maternity sites because the Forest Service buffers mines known to be occupied. In addition, no prescribed fire and few timber projects occur during winter, and old structures are not destroyed because of their historical value. Not all mines that occur in the cumulative effects area are known, and thus are not surveyed for projects. Recreational and commercial use of mines and illegal use of historical structures that support Pacific western big-eared bats potentially cause disturbance of summer roost sites, maternity sites, and hibernacula during late autumn. However, few recreationists or miners explore mines during winter.

Risk Assessment

These bats have been documented at two locations within the South Deep planning area and may occur at other unknown sites in the analysis area. Because of the potential to affect unknown sites, Alternatives E and G "may impact" individual Townsend's big-eared bats but are "not likely to result in a trend toward Federal listing or loss of viability".

The Consequences of adverse effects is moderate because of the limited number of bats in the project area. The Likelihood of adverse effects is Low because known sites that had the greatest potential to serve as hibernacula or maternity colonies have been protected.

Fisher (*Martes pennanti pacifica*)

Status: Sensitive (USFS Region 6 List)

Alternative A – No Action

Direct, Indirect, and Cumulative Effects

Alternative A will not alter any existing habitat conditions that may be present for fishers. Stands (including densely stocked small diameter ones) would not be thinned and roads would not be constructed. The density of overhead cover and the occurrence of older stands would not be altered. Over the short term, Alternative A would have the least negative impact because no additional fragmentation or change to canopy would occur. Over the long term, this alternative presents a greater risk from wildfire because many stands are overstocked and the habitat is not capable of maintaining those conditions over a long period of time.

The No Action alternative contributes toward maintaining potential fisher use over the short term by avoiding any vegetative treatments that may impact any existing fisher habitat. Over the long term, by increasing the risk of insect infestations, disease, or wildfire, it does not contribute cumulatively toward the development or maintenance of healthy diverse fisher habitat conditions across the landscape.

Alternative E and Alternative G

Direct and Indirect Effects

Currently, the South Deep watershed does not provide much high quality habitat for fisher, but there are exceptions. Existing habitat conditions are predominately shaped by the large fires that swept over much of the area in the past, resulting in the current over-abundance of densely stocked timber stands and smaller diameter trees that are not developing into the larger tree, multi-stratum habitat preferred by these species. Both action alternatives have the potential to negatively affect potential fisher habitat. Either action alternative could cause the loss of potential or unknown denning trees. However, the establishment and maintenance of an interconnected network of MA-1 and MR areas; riparian buffers; and implementation of snag marking guidelines incorporated into both action alternatives should provide adequate potential fisher habitat.

Both action alternatives equally protect or maintain existing conditions because commercial timber harvest will not occur within MA-1 boundaries, pileated woodpecker MRs, or the current (A) rotations within pine marten/northern three-toed woodpecker MRs. The action alternatives provide for some non-commercial treatments within MR areas as well as commercial timber harvests within "B" or "C" rotation blocks in pine marten/northern three-toed woodpecker MRs. Treatments proposed under the action alternatives are designed to maintain or improve existing conditions or promote establishment of desired habitat conditions in the future. Travel linkages (connectivity corridors) have been designated to facilitate species movements between MA-1 and MR areas. Outside of MA-1 and MR areas, most harvest prescriptions are designed to move the stand towards late structural stage more rapidly than if harvest did not occur. Both action alternatives also result in a net decrease in open road densities. Thus, over time, the entire project area should provide better fisher habitat conditions than currently exist.

Cumulative Effects

The Forest Plan established a network of areas across the Forest designed to retain and promote the development of late and old forest habitat conditions to provide habitat for barred owls, pileated woodpeckers, pine marten and northern three-toed woodpeckers. These areas also provide potential fisher habitat. The Forest Plan recognized that these habitat conditions could not be provided or maintained everywhere within a managed forest landscape and that some suitable and existing habitat areas could be impacted by management activities. This network was designed to insure the retention of suitable amounts of habitat, well disturbed across the Forest to provide for these species over the long term. This habitat network will also benefit fisher.

Under the current Forest Plan, the Colville National Forest has been quite successful in protecting and managing these MA-1 and MR areas across a broad landscape. Implementation of the direction contained in the Continuation of Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales (Eastside Screens), is also helping insure that these habitat areas remain interconnected to facilitate species movement across the landscape. All these measures will reduce any cumulative negative effect of management activities on fishers and their habitat Forest-wide.

Existing direction under the Continuation of Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales also directs most timber harvest activities on the Forest toward retention and establishment of late structure stands and enhancement of younger stands toward late structure conditions. This helps insure the persistence of other suitable habitat across the landscape for fishers.

Timber harvest prescriptions and identified connectivity corridors under the action alternatives will protect or enhance existing fisher habitat conditions, and promote healthier, more resilient timber stand conditions that will continue to provide for this species in the future. Cumulatively, these actions contribute favorably to actions occurring on other parts of the Forest.

Risk Assessment

The no action alternative, Alternative A, is expected to have "no impact" directly. Both action alternatives "may impact individual fisher or habitat, but are not likely to result in a trend toward Federal listing or loss of viability for the population or species".

Great Gray Owl (*Strix nebulosa*)

Status: Sensitive (USFWS Region 6 List)

Alternative A – No Action

Direct and Indirect Effects

There are no known nests for great gray owls in the analysis area. The No Action alternative, Alternative A, will not directly affect potential nest sites or other great gray owl habitat components over the short term. Over the long term, this alternative presents a greater risk from wildfire because many stands are overstocked and the habitat is not capable of maintaining those conditions. This could result in a loss of any existing great gray owl habitat and a reduction in potential habitat for many years.

Cumulative effects

Within the South Deep watershed, potential great gray owl habitat conditions have been affected by a wide variety of management activities. Some activities, primarily on what are now private lands, have eliminated historically forested areas and potential nesting habitat. Fire suppression has reduced much of the natural habitat diversity and potential foraging habitat that occurred across this watershed. Exotic plant and animal species have successfully invaded this area, potentially altering foraging habitat and prey species availability. Currently, much of the riparian habitat in the planning area is altered from historical conditions, especially on other ownerships. Livestock grazing has been introduced on both private and public lands. Numerous timber management projects have occurred in this watershed over the last 30 years and others are expected to occur in the future. Recreational activities and numerous other small projects (for example, trail reconstruction/relocation or repairing OHV damage) that may disturb individual nests have also occurred and will continue in the future.

The cumulative effects of all these activities have been proportionally greater in potential foraging habitat that historically has been transitory in nature and/or limited in supply, such as forest openings, riparian habitat, early successional forests, and single stratum forest types. Current and future management activities that maintain or improve these types of habitats contribute cumulatively to the perpetuation of any species that require these conditions. Activities that do not maintain or improve these habitats do not contribute cumulatively to maintenance of existing habitat for those species.

Alternative E and Alternative G

Direct and Indirect Effects

Maintaining great gray owl habitat can be compatible with forest management. Natural meadow systems and other openings can be maintained and restored through fire management. Timber harvest units can provide open foraging habitat. Great gray owls will nest in small patches of mature forest if suitable nesting structures exist. Younger forest stands with residual older forest components can also provide nesting habitat. Retention of large trees with suitable nesting platforms is important for maintaining nesting habitat.

Both action alternatives have the potential to negatively affect great gray owl habitat by altering nest site availability and/or affect unknown nests, however there are numerous elements within both action alternatives that insure that potential great gray owl habitat will persist in this area. These elements include:

There will be no impact to potential nesting habitat in structural stage 6 stands because these are excluded from treatment in both action alternatives; Structural stage 5 stands that occur within MA-1 areas, pileated woodpecker MRs or pine marten MRs ("A" rotation blocks) will not have any commercial timber harvest; Some studies indicated that great gray owl foraging may also occur in stands with low canopy cover. Some of the proposed harvest may enhance forage opportunities by opening up dense stands; Forest management that maintains a mix of successional stages and maintains well-distributed mature and older forest stands having platforms for nests and dense canopy cover and escape perches for young should be compatible with management for this species.

Cumulative Effects

Both action alternatives provide opportunities to maintain and improve existing habitat conditions, restore under-represented habitat such as large trees, late and old stand structures, and openings as well as promote healthier, more resilient forest conditions across the watershed. Both alternatives fully implement a network of areas designed to retain and promote the development of late and old forest habitat conditions that could provide nesting habitat for great gray owls. These alternatives direct planned timber harvest activities toward retention and establishment of late structure stands and enhancement of younger stands toward late structure conditions. This helps insure the persistence of potential nesting habitat across the watershed.

No great gray owl nests have ever been documented within this project area, and only one sighting has been reported, so it is difficult to accurately assess the effects, if any, of past activities. However, both action alternatives proposed in this analysis contain measures that are expected to perpetuate the type of habitat conditions reported as suitable for great gray owl foraging and nesting over the long term. Neither action alternative is expected to have any cumulative negative effects to great gray owl.

Risk Assessment

Alternative A would have no impacts on gray owls and great gray owl habitat in the short term. Both action alternatives propose harvest in great gray owl habitat but will still provide for the retention of suitable habitat characteristics over the short term. In the absence of any documented great gray owl activity in this area, the action alternatives "may impact individual great gray owls or their habitat, but are not likely to result in a trend toward Federal listing or loss of viability".

Peregrine falcon (*Falco peregrinus*)

Status: Sensitive (USFWS Region 6 List)

Direct, Indirect, and Cumulative Effects

All alternatives will have “no impact” on peregrine falcons or their habitat either directly, indirectly or cumulatively. No records indicate that peregrine falcons have ever nested on or near the analysis area.

Interior Redband trout (*Oncorhynchus mykiss gairdneri*)

Status: Sensitive USFS Region 6 List

Direct and Indirect Effects

Under no action, soil movement into the streams would continue from use of the road systems and grazing in riparian areas. Implementation of action alternatives E and G would include the construction of new roads and reconstruction of existing roads within the analysis area. These alternatives may temporarily increase the level of soil movement into certain streams from new road crossings and heavily reconstructed road crossings within the analysis area. The results may be a temporary increase in the embeddedness of the substrate and pool filling in low gradient segments downstream of the sites of these proposed activities. Any increase in soil movement into the stream systems is expected to be temporary until armoring and revegetation of crossings is completed. Any temporary increase in the level of embeddedness could reduce the available amount of winter rearing pool habitat and may decrease the available spawning area for trout possibly influencing their winter survival and reproductive success respectively. However, since pure interior redband trout are not known to inhabit the project area nor the larger watershed, there is “no effect” from implementation of any action alternative to this subspecies or its habitat.

Cumulative Effects

Logging and road construction is expected to continue on private lands in the South Deep Creek watershed. The implementation of the no action alternative will allow soil movement into the streams to continue from use of the road systems and grazing in riparian areas. Sediment introduction from these tributaries most likely incrementally degrades habitat in the South Fork of Deep Creek. The proposed activities, under either of the action alternatives, propose a limited amount of additional disturbance in streams that otherwise are in a fairly functional state providing bank stabilization and overhead shade among other functions. Any potential increase in sediment levels in tributary streams, in addition to effects on private lands, again may incrementally degrade the existing habitat conditions in the lower gradient segments of Rocky Creek and the South Fork Deep Creek. However, pure interior redband trout are not known to inhabit the South Fork of Deep Creek or its tributaries within the analysis area. For these reasons, the proposed alternatives will have “no effect” to interior redband trout or their habitat.

Westslope cutthroat trout (*Oncorhynchus clarki lewisi*)

Status: Sensitive USFS Region 6 List

Direct and Indirect Effects

The implementation of the no action alternative will allow soil movement into the streams to continue from use of the road systems and grazing in riparian areas. Low to moderate levels of sediment increasing the embeddedness of the streambed substrate continue to affect the westslope cutthroat trout populations and their habitat in Byers and Rocky creeks. Implementation of action alternatives E and G would include the construction of new and reconstruction of existing roads within these watersheds containing these cutthroat populations. These alternatives may temporarily increase the level of soil movement into certain streams, including Rocky and Rogers creeks, from heavily reconstructed road crossings within the analysis area. The results may be a temporary increase in the embeddedness of the substrate and pool filling in low gradient segments downstream of the sites of these proposed activities. Any increase in soil movement into the stream systems is expected to be temporary until armoring and revegetation of crossings is completed. Any temporary increase in the level of embeddedness could reduce the available amount of winter rearing pool habitat and may decrease the available spawning area in the low gradient sections of Rocky Creek and South Deep Creek. Cutthroat trout are not known in these waters. Any temporary increase in sediment is not expected to influence their winter survival and reproductive success due to this reason. It will have a temporary effect of increasing the amount of sediment passing through higher gradient habitat where cutthroat trout reside. This increase in sediment may temporarily degrade spawning and rearing habitat until flushed out of the system. For this reason, either of the action alternatives “may affect” westslope cutthroat trout and their habitat in South Deep Creek tributaries where this subspecies presently exists. Any effect is expected to be temporary and is not expected to lead towards a trend for federal listing of this subspecies.

Cumulative Effects

Logging and road construction is expected to continue on private lands in the South Deep Creek watershed. Soil movement and reduction in riparian function along non-fish bearing perennial and intermittent streams on state and private lands will continue to degrade fish habitat in lower gradients downstream. The implementation of the no action alternative will allow soil movement into the streams to continue primarily from use of the road systems and grazing in riparian areas on Forest Service lands. Sediment introduction from these tributaries will incrementally degrade habitat in the South Fork of Deep Creek. Both action alternatives propose some removal of vegetation within riparian habitat conservation areas that are occupied by cutthroat trout or in tributaries that flow into occupied habitat through the construction and reconstruction of road crossings in riparian habitat conservation areas. These activities, under these action alternatives, propose a limited amount of disturbance in streams that otherwise are in a fairly functional state providing bank stabilization and overhead shade among other functions. Any temporary increase in on-site erosion may temporarily and incrementally degrade the existing habitat conditions in low gradient segments of streams within the analysis area. These low gradient segments are not inhabited by westslope cutthroat trout. All known cutthroat trout populations (Rocky, Byers and Rogers creeks) are found on Forest Service or state lands within the analysis area. Any temporary increase in sediment is not expected to influence their winter survival and reproductive success due to this reason. It will have a temporary effect of increasing the amount of sediment passing through higher gradient habitat where cutthroat trout reside. This increase in sediment may temporarily degrade spawning and rearing habitat until flushed out of the system. When considering the potential effect of either action alternative with all other activities that are ongoing or may occur in the near future in the analysis area, the non-Forest Service activities would affect fish habitat not currently known to be occupied by westslope cutthroat trout. For these reasons, the proposed alternatives will have “no effect” cumulatively to westslope cutthroat trout or their habitat.

Pygmy whitefish (*Prosopium coulteri*)

Status: Sensitive USFS Region 6 List

Direct and Indirect Effects of the Alternatives

The implementation of the no action alternative will allow soil movement into the streams to continue from use of the road systems and grazing in riparian areas. Implementation of action alternatives E and G would include the construction of new and reconstruction of existing roads within the analysis area. These alternatives may temporarily increase the level of soil movement into certain streams from new road crossings and heavily reconstructed road crossings within the analysis area. The results may be a temporary increase in the embeddedness of the substrate and pool filling in low gradient segments immediately below the sites of these proposed activities. Any increase in soil movement into the stream systems is expected to be temporary until armoring and revegetation of crossings is completed. Any temporary increase in the level of embeddedness could reduce the available amount of winter rearing pool habitat and may decrease the available spawning area in lower gradient reaches within the analysis area for whitefish possibly influencing their winter survival and reproductive success respectively. However, since pygmy whitefish are not known to inhabit the project area nor the larger watershed, there is “no effect” from implementation of any action alternative to this species or its habitat.

Cumulative Effects

Logging and road construction is expected to continue on private lands in the South Deep Creek watershed. The implementation of the no action alternative will allow soil movement into the streams to continue from use of the road systems and grazing in riparian areas. Sediment introduction from these tributaries most likely incrementally degrades habitat in the South Fork of Deep Creek. The proposed activities, under any of the action alternatives, propose a limited amount of additional disturbance in streams that otherwise are in a fairly functional state providing bank stabilization and overhead shade among other functions. Any potential increase in sediment levels or summer water temperatures in tributary streams, in addition to existing effects, again may incrementally degrade the existing habitat conditions in the lower reaches of Rocky Creek and the South Fork Deep Creek. However, pygmy whitefish are not known to inhabit the South Fork of Deep Creek or its tributaries within the analysis area. Pygmy whitefish are also not known to inhabit Lake Roosevelt. For these reasons, the proposed alternatives will have “no effect” to pygmy whitefish or their habitat.

4.2.6 Wildlife Management Indicator Species: Effects of the Alternatives

The following analysis is derived from the Wildlife Management Indicator Species Report for the South Deep Management Project and is available for review in the analyses file at the Three Rivers Ranger District office.

Ungulates (Big Game)

Alternative A – No Action

Direct and Indirect Effects

Under Alternative A, the No Action alternative, the existing forage:cover ratio within winter range areas would be expected to continue the existing trend away from Forest Plan objectives. Without treatment,

and in the absence of any other disturbance, existing stand densities and crown closure will increase over time, and understory forage availability will decline due to competition, lack of sunlight, and decadence due to age. Without adequate forage, this area would not provide suitable ungulate habitat and would not contribute toward meeting the Forest Plan objective for forage:cover ratios or deer and elk population levels.

However, as stand densities increase, so does the risk of large scale disturbances such as insect and/or disease problems or large, stand-replacing wildfires. Under this scenario, one or more large scale disturbances could destroy most or all of the existing cover, potentially resulting in an over-abundance of forage, at least over the short term. But abundant forage, without adequate amounts and distribution of suitable cover, is also unsuitable as winter habitat for ungulates and would not meet Forest Plan direction.

Alternative A would not affect existing open road densities or habitat security. The area would remain within existing Forest Plan direction.

The No Action Alternative also places the project area at greater risk for large scale disturbances (insects, disease or wildfire) that could negatively affect forage and cover distribution and availability for many years.

Alternatives E and G

Direct and Indirect Effects

The effects to winter range, and the differences between the action alternatives (Alternative E and Alternative G), are related primarily to the way each alternative affects existing forage:cover ratios. Both of the action alternatives propose commercial treatments within winter range areas to address the need to reduce hazardous fuels and improve forest health. Alternative E contains 38 treatment units (1580 acres) that are located entirely or partially within MA-6 or MA-8 areas. Alternative G contains 46 units (2424 acres) all or partially in MA-6 and/or MA-8 areas.

A variety of silvicultural treatments have been prescribed under both action alternatives. Commercial harvest activities (see descriptions in Chapter 2) with the greatest likelihood of affecting available cover within winter range areas include commercial thinning harvest; shelterwood harvest; overstory removal harvest and clearcut with reserve tree harvest. Single tree selection harvests and irregular shelterwood harvests are not expected to dramatically alter existing cover qualities within treatment areas. Precommercial thinnings and other non-commercial treatments prescribed under each alternative are also not expected to dramatically alter current forage:cover ratios. Both action alternatives contain prescriptions for 150 acres of prescribed fire within winter range areas to improve existing forage resources.

Under Alternative E, thinning, shelterwood, overstory removal, and clearcut with reserve tree treatments are prescribed in winter range units (see Table 4-28). These treatments would reduce most of the existing over-abundance of cover and, assuming the resulting stands could be classified as forage, would result in a forage:cover ratio of approximately 51:49. This would move the winter range within the project area more in line with Forest Plan objectives.

Under Alternative G, harvest prescriptions in winter range units could potentially affect existing cover, resulting in a forage:cover ratio (using the same assumptions presented for Alternative E) of approximately 56:44.

Table 4-28. Winter Range Acres* Treated by Alternative

	Commercial Thinning	Single tree Selection	Overstory Removal	Shelterwood	Irregular Shelterwood	Clearecut with Reserve Tree
Alternative E	614	813	89	9	642	257
Alternative G	549	735	89	9	356	150

* Some harvest units contain acreage not designated as winter range (MA-6 or MA-8)

The resulting forage:cover ratios shown above for both action alternatives are only estimates and can only be predicted with limited accuracy for several reasons, including the following:

Several harvest units used in the calculations for both alternatives contain areas not classified as winter range (MA-6 or MA-8); adjustments for riparian buffers or other environmental considerations are not reflected here; existing stand densities are variable and harvest activities will not necessarily change conditions from cover to forage on every acre; and the number and size of created openings varies between alternatives.

Both action alternatives would reduce the existing over-abundance of cover and provide more opportunities to produce and manage forage resources. Given the assumptions described above, both action alternatives are expected to bring the resulting winter range habitat conditions more in line with Forest Plan objectives. However, Alternative G, with its higher harvest levels and larger created opening sizes, has the potential to affect more acres of existing cover and could result in shifting the forage:cover ratio further from the desired 50:50 ratio than Alternative E.

Although road construction and reconstruction levels vary between the action alternatives, neither alternative results in a net increase in open road densities or reductions in habitat security within designated winter range. Because the existing open road density is below the Forest Plan maximum of 1.5 miles per square mile, both action alternatives comply with existing Forest Plan management direction.

Cumulative Effects

The quantity and quality of ungulate winter range in the Colville National Forest area has varied considerably over time and has been largely reduced from historic levels. Much of what was historically winter range is now in private or other ownerships and may or may not be managed with consideration for wintering ungulate needs. Many of these lower elevation areas have been converted to agricultural uses and may provide suitable winter forage, depending on land use, distance to suitable cover, and landowner tolerance. Large fires that occasionally burned across this landscape also altered forage and cover availability. Settlement and the advent of various land management activities resulted in roads that affect habitat security as well as the introduction of several noxious weed species that affect forage availability. Fire suppression over this same time period has contributed to adverse changes in the amount and distribution of both forage and cover. Much of what is currently managed on the Colville National Forest as winter range is a remnant of historical winter range and/or lands that served as secondary winter range areas prior to settlement and land conversions.

Since the Forest Plan became effective in 1988, management projects on Forest Service administered lands within these areas have been designed to incorporate wild ungulate winter range requirements, including a goal of improving the ratio of cover and forage. Timber sales and other projects (including this one) have been designed and analyzed according to Forest Plan direction. The cumulative, long-range result will be progress toward the desired 50:50 forage:cover ratio across the landscape, though treatments to reduce effects of insects/disease and weather may decrease cover availability in specific areas over the short-term. Timber management and prescribed fire projects have also been conducted to increase forage quantity in many areas. The action alternatives proposed for the South Deep Management Project continue this trend and will result in improved forage:cover ratios and forage conditions within this portion of the landscape and add cumulatively to the progress already made in other

portions of the Forest. The No Action Alternative does not contribute to this trend and places this area at greater risk for large scale disturbances (insects or disease problems and/or stand replacing wildfire) that could adversely affect wintering ungulate habitat for many years.

Road densities within winter range have increased considerable since early settlement days, with a resulting decrease in ungulate habitat security. Many early Forest Service projects contributed to this problem. Under the Forest Plan, efforts are now being made to reduce this effect by requiring that new roads be closed (or no net gain is allowed if leaving a specific road open is necessary for other management considerations) and that winter range areas are managed to achieve specific open road densities to minimize disturbance. Across the Colville National Forest many miles of roads, especially within winter range areas have been closed, obliterated, and/or revegetated to reduce disturbance impacts from motorized vehicles and overall road densities are declining. The action alternatives presented for the South Deep Management Project continue this trend by resulting in a net decrease in road mileage within the South Deep watershed.

It is recognized that ground disturbing activities, including timber harvest, road construction and reconstruction, and prescribed fire, can spread or increase noxious weed populations that can displace wild ungulate forage. Cattle grazing and motorized vehicles also help spread noxious weeds. Standardized practices on the Colville National Forest, as well as specific mitigation measures prescribed for the action alternatives in the South Deep Management Project, have been designed to contain or reduce this impact, and should not contribute cumulatively to this existing problem.

Conclusions

The existing forage:cover ratio of 30:70 within designated winter range (MA-6 and MA-8) in this project area does not currently meet Forest Plan expectations. Both action alternatives reduce the over-abundance of cover and should provide additional forage opportunities to move toward the desired 50:50 ratio. Alternative E is expected to move this area closer to the desired forage:cover ratio than Alternative G.

Designated winter range within the South Deep project area is currently in compliance with Forest Plan direction regarding open road densities. Neither action alternative will alter this situation.

Prescribed burning activities under both action alternatives are expected to improve existing forage quality and quantity within treatment areas.

Pine Marten, Pileated Woodpecker, Barred Owl, and Northern Three-toed Woodpecker

Alternative A – No Action

Direct and Indirect Effects

The No Action Alternative does not change the status of marten, pileated woodpecker, barred owl or northern three-toed woodpecker habitat in the near term unless there are insect outbreaks, wildfires, or other disturbances that change stand structure. Otherwise, habitat would not degrade or improve in the near term.

Alternative E and Alternative G

Direct and Indirect Effects

Effects of proposed actions on barred owls, pileated woodpeckers, pine marten, and northern three-toed woodpeckers are assessed primarily by addressing the effects of proposed actions on the habitat

conditions within MA-1 areas and MR areas. Although it is recognized that these species may occur in suitable habitat outside the designated MA-1 and MR areas, the establishment and maintenance of desired conditions within MA-1 and MR areas was considered sufficient to provide for these species across the Colville National Forest and the established standards and guidelines for managing these areas provides an effective baseline for evaluation of the existing conditions and expected effects of alternatives on these species across a broad landscape.

Effects on MA-1 Areas

MA-1 areas were established to insure habitat for barred owls, but they are also managed to support pileated woodpecker, pine marten and northern three toed woodpecker habitat as required by the Forest Plan. Each MA-1 area has a core habitat area and foraging areas. All four MA-1 areas in the South Deep watershed meet Forest plan direction for core habitat areas. Foraging areas in the Hudson/Thomas MA-1 also meet Forest Plan direction. Modifications to foraging areas in the other three MA-1 areas would be needed to meet Forest Plan direction. However, changes to MA-1 areas require a Forest Plan amendment and consequently are deferred to the Colville Forest Plan revision process.

Hudson/Thomas MA-1: Neither of the action alternatives are expected to adversely affect this MA-1 area or prevent the establishment of desired habitat conditions. Commercial harvest units SDR (Alternatives E and G), DFB (Alternative E only), and DFM (Alternative E only) are adjacent or very near to this MA-1 area. The proposed harvest in these units will not directly affect desired habitat conditions within the MA-1 boundary. No precommercial thinning has been proposed within the boundary of this area under either action alternative. Fuel reduction unit ZM has been proposed under both action alternatives in the northeastern part of the MA-1. This treatment unit is located in a more open portion of the MA-1 and the proposed treatment is not expected to alter any desired habitat characteristics currently found in the area.

Rogers MA-1: Neither of the proposed action alternatives are expected to adversely affect this MA-1 area or prevent the establishment of desired habitat conditions. No commercial harvests planned under either action alternative will impact this MA-1 area. Both action alternatives contain precommercial thinning unit TBC which is located partially within this MA-1 boundary. This activity should benefit the MA-1 area over the long term by helping to develop the desired habitat characteristics and contribute to making the area more resilient in the event of insect or disease outbreak or wildfire

Big Meadow Lake MA-1: Neither of the proposed action alternatives are expected to adversely affect this MA-1 area or prevent the establishment of desired habitat conditions.

Smackout MA-1: None of the proposed action alternatives are expected to adversely affect this MA-1 area or prevent the establishment of desired habitat conditions.

Commercial harvest unit NBA (Alternative G only) overlaps with a small portion of this MA-1 area. Should this unit be selected for harvest, the unit boundary will be laid out to exclude the MA-1 area. No harvest will occur in MA-1 areas, per Forest Plan direction (Forest Plan, p. 4-71).

Precommercial thinning unit TA is proposed within this MA-1 area in both action alternatives. The precommercial thinning may help these trees develop the desired habitat conditions faster than they would without treatment.

Existing roads 1728250 and 1728255 are within this MA-1. These two roads are proposed for use with moderate reconstruction in both action alternatives. Opening and constructing this road would allow more access for firewood collection, with potential loss of snags and downed logs, unless this road is closed or posted. To comply with Forest Plan direction regarding maintenance of snags and downed logs, post-treatment firewood collection activities would be controlled in MA-1 and MR areas through road closures. Signing would be funded as a Knutsen-Vandenberg project.

Effects on Pileated Woodpecker MRs

Pileated woodpecker MR areas (in conjunction with MA-1 areas) were established to ensure that habitat for pileated woodpeckers is well distributed across the landscape. These areas are also intended to

provide habitat pine marten and northern three toed woodpeckers. Adjustments to existing area sizes and locations are permitted when needed to better meet Forest Plan objectives, and do not require a Forest Plan amendment. The following discussion includes the changes proposed in both action alternatives needed to meet Forest Plan direction.

PW05: No changes to the size or existing boundaries of PW05 are proposed. None of the proposed alternatives are expected to adversely affect this MR area or prevent the establishment of desired habitat conditions. No treatments that would affect existing habitat conditions within PW05 are proposed in either of the action alternatives.

PW06: Changes to the boundary of PW06 are proposed in both action alternatives. The new delineation is bounded by the powerline right of way on the eastern side, increasing the area to about 315 acres. Neither of the proposed action alternatives are expected to adversely affect this MR area or prevent the establishment of desired habitat conditions. No commercial harvests are proposed within this MR in either action alternative. Precommercial thinning unit TAJ is proposed in the western portion of PW06 in both action alternatives. Over time, this treatment may increase the quality of habitat in the treated area. As long as efforts are made to maintain suitable large trees, snags and downed logs (per Forest Plan direction) these activities should not prevent attainment of Forest Plan objectives for this area.

Effects on Pine Marten/Northern Three-toed Woodpecker MRs

Pine marten/Northern three-toed woodpecker MR areas (in conjunction with MA-1 and pileated woodpecker MR areas) were established to ensure that habitat for these species is well distributed across the Colville National Forest. These MR areas are composed of current habitat ("A" blocks). Adjustments to existing area sizes and locations are permitted when needed to better meet Forest Plan objectives, and do not require a Forest Plan amendment. The following discussion includes the changes proposed in both action alternatives needed to meet Forest Plan direction.

PM29: A portion of the "A" block of this MR was incorrectly located on private land. The new "A" block would be located to the south and west of the current location, in T36N R41E Sections 29 and 36. Forest Road 7018290 is proposed for heavy reconstruction and extension in both action alternatives. Opening and constructing this road would allow more access for firewood collection, with potential loss of snags and downed logs, unless this road is closed or posted. To comply with Forest Plan direction regarding maintenance of snags and downed logs, post-treatment firewood collection activities would be controlled in MA-1 and MR areas through road closures. Signing would be funded as a Knutsen-Vandenberg project. With this mitigation, the action alternatives would not prevent attainment of Forest Plan objectives for this area. No other management activities are proposed under any alternative that would impact this MR.

PM30: Both action alternatives propose to change the "A" block of this MR. The new "A" block is larger (by approximately 24 acres, increasing the area to 178 acres) and uses existing roads to better define boundaries. The primary reason for the new delineation is to make the area easier to identify on the ground. No management activities are proposed in the "A" block in either action alternative. As long as efforts are made to control firewood collection along the new boundary and maintain suitable large trees, snags and downed logs (per Forest Plan direction) neither action alternative would prevent attainment of Forest Plan objectives for this area.

PM31: No changes in size or boundary location are proposed for this MR. Neither of the alternatives proposes any treatments within the "A" block, and there would be no impacts to current habitat.

PM37: No changes in size or boundary location are proposed for this MR. Neither action alternative proposes any treatments within the "A" block, and there would be no impacts to current habitat.

PM38: Open stands in the southeastern part of the existing "A" block are not good marten habitat. More suitable habitat occurs on the west side and to the north. The more suitable habitat would be added and the less suitable habitat excluded. No commercial treatment is proposed in the "A" block, but a portion of fuel reduction unit ZU overlaps with the new boundary of this area. As long as efforts are made to maintain suitable large trees, snags and downed logs (per Forest Plan direction), this activity would not prevent attainment of Forest Plan objectives for this area.

PM39: No changes in size or boundary location are proposed for this MR. In both alternatives, precommercial thinning units TBF, TBH and TBK overlap with the “A” block, but as long as efforts are made to maintain suitable large trees, snags and downed logs (per Forest Plan direction), this activity would not prevent attainment of Forest Plan objectives for this area.

PM40: No changes in size or boundary location are proposed for this MR. In both action alternatives, a portion of precommercial thinning unit TCA overlaps with the southern portion of the “A” block, but the activity would not affect existing desired conditions and would promote attainment of better habitat conditions in the future.

PM41: No changes in size or boundary location are proposed for this MR. Neither action alternative would alter the “A” block of this MR.

PM42: No changes are in size or boundary location are proposed for this MR. In both action alternatives, all or portions of precommercial thinning units T1 and TK are proposed in the “A” block of this MR. As long as efforts are made to maintain suitable large trees, snags and downed logs (per Forest Plan direction) these activities would not prevent attainment of Forest Plan objectives for this area.

PM43: No changes are in size or boundary location are proposed for this MR. No new roads or treatments are proposed in the “A” block of this MR in either action alternative.

PM44: No changes are in size or boundary location are proposed for this MR. The “A” block of this MR is outside of the project area and the proposed actions would not affect current habitat.

Figure 4-1. Proposed MA-1 and MR Areas, South Deep Watershed



Effects to Habitat Connectivity

Potential corridor connections between MRs, MA-1 and late structure habitat were identified, mapped, and formalized during project planning for both action alternatives. Identification of corridors attempted to coincide with riparian Inland Native Fish Strategy buffers when practical and avoid private/other ownership as much as possible. In addition attempts were made to delineate corridors that are less impacted by existing roads, units, natural openings and densely stocked, small diameter stands. When corridors coincided with smaller Inland Native Fish Strategy buffers, the widths were expanded to meet corridor requirements.

Commercial thinning, road construction, precommercial thinning, and noncommercial treatments are all proposed in the areas identified as corridors in both action alternatives. Any of these treatments may reduce the effectiveness of delineated corridors. As long as efforts are made to maintain corridor width and canopy coverage during the implementation of these activities in accordance with the Continuation of Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales (Eastside Screens amendment), these activities should not prevent attainment of established objectives. These corridors are not established as permanent landscape features and are applicable only for the current analysis and project planning cycle. Future entries into the South Deep watershed may alter the number and arrangement of these corridors to better reflect conditions and management direction existing at that time.

Cumulative Effects

The Forest Plan established a network of areas across the Forest designed to retain and promote the development of late and old forest habitat conditions that would provide habitat for barred owls, pileated woodpeckers, pine marten and northern three-toed woodpeckers. It recognized that these habitat conditions could not be provided or maintained everywhere within a managed forest landscape and that some suitable and existing habitat areas could be impacted by management activities. This network was designed to insure the retention of suitable amounts of habitat, well disturbed across the Forest to provide for these species over the long term.

Under the current Forest Plan, the Colville National Forest has been quite successful in protecting and managing these MA-1 and MR areas across a broad landscape. Implementation of the direction contained in the Continuation of Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales (Eastside Screens), is also helping insure that these habitat areas remain interconnected to facilitate species movement across the landscape. All these measures are designed to reduce any cumulative negative effect of management activities on barred owls, pileated woodpeckers, pine marten and northern three-toed woodpeckers and their habitat Forest-wide.

Existing direction under the Continuation of Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales also directs most timber harvest activities on the Forest toward retention and establishment of late structure stands and enhancement of younger stands toward late structure conditions. This helps insure the persistence of other suitable habitat across the landscape for barred owls, pileated woodpeckers, pine marten and northern three-toed woodpeckers.

Timber harvest prescriptions and identified connectivity corridors under the action alternatives have been designed to protect or enhance existing barred owl, pileated woodpeckers pine marten and northern three-toed woodpecker management areas, and, promote healthier, more resilient timber stand conditions that will continue to provide for these species in the future. Cumulatively, these actions contribute favorably to actions occurring on other parts of the Forest and contribute toward meeting Forest Plan direction across the landscape.

The No Action alternative (Alternative A) contributes toward meeting Forest Plan direction over the short term by avoiding any vegetative treatments that may impact existing barred owl, pileated woodpecker, pine marten and northern three-toed woodpecker habitat. Over the long term, by increasing the risk of insect infestations, disease, or wildfire, it does not contribute toward development or maintenance of health diverse forest conditions that will continue to support these species across the landscape. The No

Action alternative does not contribute cumulatively to meeting Forest Plan objectives for these species because the necessary identified adjustments to MA-1 and MR area boundaries would not be made at this time.

Conclusions

Both action alternatives equally protect or maintain existing conditions because commercial timber harvest will not occur within MA-1 boundaries, pileated woodpecker MRs, or the current (A) rotations within pine marten/northern three-toed woodpecker MRs. These treatments are designed to maintain or improve existing conditions or promote establishment of desired habitat conditions in the future. Travel linkages (connectivity corridors) have been designated to facilitate species movements between MA-1 and MR areas. Outside of MA-1 and MR areas, most harvest prescriptions are designed to move the stand towards late structural stage more rapidly than if harvest did not occur. Thus, over time, the entire project area should provide better northern three-toed woodpecker, pine marten, pileated and barred owl habitat conditions than currently exist.

Beaver (*Castor canadensis*)

Alternative A – No Action

Direct, Indirect, and Cumulative Effects

Alternative A would have no effect directly, indirectly, or cumulatively on beaver habitat. In the absence of large scale disturbance, no improvement in beaver habitat would occur.

Alternative E and Alternative G

Direct and Indirect Effects

Converting portions of the conifer-dominated riparian area to hardwood trees or shrubs would improve beaver habitat in the drainage. No alternative proposes any commercial harvest in riparian areas, but both action alternatives do propose about 70 acres of precommercial thinning in previous harvest units and a small portion of fuels reduction units that affect riparian areas. The amount is negligible in terms of all riparian habitat, but precommercial thinning and prescribed fire would stimulate some hardwood regeneration.

Cumulative Effects

The area considered for cumulative effects analysis consists of the entire district. Planned and completed projects would have or had little positive effect to beaver habitat because the Forest Service established no-harvest buffers around riparian areas based on the Inland Native Fish Strategy (USDA FS 1995), allowing little or no commercial harvest in riparian areas. Lack of disturbance continues to reduce beaver habitat. This project will not contribute cumulatively to enhancing beaver habitat.

Conclusions

Only precommercial thinning and prescribed fire units will affect riparian areas, so none of the alternatives will improve or degrade beaver habitat much from existing conditions, and no alternative will contribute much to enhance beaver habitat.

Blue Grouse (*Dendragapus obscurus*)

Alternative A – No Action

Direct and Indirect Effects

Alternative A will not enter any blue grouse habitat.

Noxious weed spread into unaffected habitat probably constitutes the greatest long-term threat to blue grouse. Alternatives that propose the least new road construction or cause the least ground disturbance will contribute least to the spread of noxious weeds, thus will have the least negative effects to blue grouse habitat.

Alternative A will not affect blue grouse habitat either positively or negatively.

Alternative E and Alternative G

Direct and Indirect Effects

Summer Nesting Habitat

Partial harvest of trees on more open, dry sites will have a beneficial effect to blue grouse nesting and brood habitat by opening the overstory and understory. Intense harvests that leave a minimum number of trees eliminate blue grouse habitat in the short-term.

A simple index of potential benefits of harvest is the amount of habitat improved by partial harvest versus the amount of habitat degraded by too intense a harvest. Alternative E improves about 4,000 acres and results in about 650 acres of habitat degraded in the short-term. Alternative G improves about 5,000 acres and results in about 2,000 acres of habitat degraded in the short-term. Table 4-29 provides these values as a percentage of blue grouse habitat on Forest Service land in the South Deep watershed.

Table 4-29. Percent of blue grouse habitat on National Forest System land affected by harvest in the South Deep watershed

	Alt. E	Alt. G
% existing negatively affected	2%	8%
% existing positively affected	15%	18%

Neither action alternative would result in an area-wide reduction in blue grouse populations, but the Alternative E negatively affects the lowest amount of blue grouse habitat and would affect blue grouse the least. All units will retain at least 8 of the largest live trees per acre.

Seven units in both action alternatives propose harvest near wetland areas. At least 50 percent of the perimeter of springs or other water sources will be maintained and no break in cover will exceed 600 lineal feet along the waters edge. (See Table 4-30.)

Table 1-30. Units in riparian areas or near wetlands in the South Deep watershed

	Unit						
Alternative	DBR	DCH	DCI	SDC	SDP	SDQ	SDS
Alt E	X	X	X	X	X	X	X
Alt G	X	X	X	X	X	X	X

Noxious weed spread into unaffected habitat probably constitutes the greatest long-term threat to blue grouse. Alternatives that propose the least new road construction or cause the least ground disturbance would contribute least to the spread of noxious weeds, and therefore would have the least negative effects to blue grouse habitat. Alternative E does not propose any road construction, and Alternative G proposes 4.9 miles of new road construction.

Areas that will be burned to reduce fuel loading will improve blue grouse habitat by opening stands and stimulating forage. Spring fires usually are conducted before onset of nesting. Those that are not would temporarily reduce blue grouse numbers: nesting females would escape the flames but the clutch could be lost. This loss would not greatly affect the blue grouse population (compensatory rather than additive mortality). Prescribed fire can also set the stage for the spread of noxious weeds. The extent and potential spread of weeds after prescribed fires has not been well documented on the Colville National Forest. All action alternatives propose the same prescribed fire in wildland/urban interface areas and post-and-pole treatments and will have the same effects. These effects are beneficial.

Winter Roosting Habitat

Portions of 17 units in Alternative E and 26 units in Alternative G affect winter roost habitat. None of the units contain stands of late structural stage. Of these prescriptions, irregular shelterwood, shelterwood and clearcut with reserve-tree have the greatest potential to negatively affect winter roost habitat because the intent of these harvests is to essentially regenerate the stand rather than thin existing trees. Portions of 7 units in Alternative E and 18 units in Alternative G are planned for harvest using these prescriptions (Table 4-31). Average size of merchantable trees in these stands is about 10 inches diameter at breast height (range 6-21 inches).

Table 4-31 Harvest units in blue grouse winter roost habitat with iHSH, HSH or HCR prescriptions

Alternative	Acres	Units									
Alt E	70	DBO	DCZ	ECB	ECV	SDG	SDN	SDT			
Alt G	530	DBO	DCG	DCK	DGF	ECB	ECK	ECL	ECV	SDG	
		SDN	SDT	WFD	WFF	WFG	WFH	WFO	WFQ	WFW	

No live trees larger than 21 inches diameter at breast height will be harvested and the 8 largest trees on each acre will be retained, which reduce negative effects to blue grouse winter habitat. Alternative E will have the least negative effects and Alternative G has the greatest, though the total effect to existing habitat from Alternative E is a 1% reduction and of Alternative G is a 6% reduction. Neither of the alternatives will have a substantial negative effect to blue grouse winter roost habitat.

Cumulative Effects

The area considered for cumulative effects analysis consists of the entire district. Planned and completed projects will have minimal effect to blue grouse because roost trees will be retained and wetlands will be buffered. Past regeneration harvest in all watersheds severely reduced blue grouse habitat by removing large ponderosa pine or Douglas-fir, especially mistletoe-infested Douglas-fir, on open, dry, south-facing slopes. The extent of this loss and the impact to blue grouse are not known.

Roads built into blue grouse habitat will increase the amount of noxious weeds and will decrease forage for blue grouse. Prescribed fires will enhance blue grouse habitat but has the potential to spread noxious weeds.

Both action alternatives affect some blue grouse habitat. All units should open the understory and might enhance the existing stands for blue grouse. No harvest would remove trees larger than 21-inch diameter at breast height, so larger roost and forage trees will not be affected. If at least 8 roost trees per acre are retained, neither of the alternatives will cause an area-wide decrease to blue grouse habitat. This element relates to the issue raised during public scoping of the need for large trees.

Conclusions

Lack of fires, and consequently succession, has resulted in shrubs and trees encroaching on open areas that blue grouse inhabit in summer, thus reducing the extent of this habitat. Partial harvest of trees on more open, dry sites will have a beneficial effect to blue grouse nesting and brood habitat by opening the understory. Regeneration harvests that leave a minimum number of trees eliminates blue grouse habitat in the short-term. Partial harvest of trees combined with prescribed fire will have a greater beneficial effect by opening the understory and stimulating vegetation. Noxious weeds spread reduces blue grouse habitat. The amount of road construction provides an index of the amount of disturbed soil, and thus of noxious weed spread.

Alternative E has a moderate short-term level of habitat improvement, creates no disturbed soil due to new road construction, and would be the best alternative for blue grouse. Alternative G improves more habitat than Alternative E but also causes the short-term degradation of more than three times the acres as Alternative E. Alternative G also proposes 2.9 miles of new road construction in potential nesting habitat.

Both action alternatives propose the same amount of prescribed fire outside of harvest units, thus will have the same beneficial effects.

Harvesting mistletoe-infested, large Douglas-fir or subalpine fir can be detrimental to habitat blue grouse use in winter for roosting and feeding. Based on the amount of regeneration harvest, Alternative E will have the least negative effects to blue grouse winter habitat (about 1% of remaining winter roosting habitat, or 70 acres) and Alternative G have the greatest potential negative effect (about 6%, or 530 acres). The Forest Plan guidelines require retaining at least 8 roost trees per acre and buffering wetlands, thus neither action alternative will have a substantial, negative effect to habitat that blue grouse use in winter.

Franklin's Grouse (*Falcapennis canadensis franklinii*)

Alternative A – No Action

Direct and Indirect Effects

Alternative A will not affect Franklin's grouse but will retain the dearth of young forage stands.

Alternative E and Alternative G

Direct and Indirect Effects

Most of the more intensive harvest prescriptions will regenerate some lodgepole pine and will have the greatest positive effect to Franklin's grouse habitat (Table 4-32). Alternative G, with the greatest proposed regeneration acreage, will have the largest positive effect. Commercial thinning, salvage and single-tree selection harvest will have minimal or no effect.

Table 4-32. Number of units in Franklin's grouse habitat, total acres affected, and amount of intensive harvest

	Alt E	Alt G
Number of units	47	63
Total acres affected	1,320	2,360
Acres of intensive harvest	322	960

Precommercial thinning on some of the 270 acres in Franklin's grouse habitat will have a negative effect (the number of acres covered by lodgepole pine was not identified). Complete loss of foraging habitat would be prevented by retaining unharvested portions (10% of acres, consisting of 0.5 to 1 acre unthinned plots) in these units.

Prescribed fire is proposed for about 680 acres. The end result will be more open stands than currently exist. These open stands provide habitat for blue grouse rather than Franklin's grouse. Thus, the fires will have a negative effect on Franklin's grouse. The amount of proposed fire is the same in each alternative and comprises a small amount of Franklin's grouse habitat. Therefore, the negative effects will be minimal.

Habitat reduced by noxious weeds remains a concern. The amount of new road construction is used as an index of soil disturbance and potential for spread of noxious weeds. Alternative E proposes no new road construction, and Alternative G proposes the most (4.9 miles).

Cumulative Effects

Franklin's grouse habitat is likely to decrease due to the recent trend towards reduced levels of regeneration harvesting in lodgepole stands. Precommercial thinning continues in several watersheds on the district. Although unthinned patches are left in thinning units, precommercial thinning in lodgepole pine decreases habitat quality for Franklin's grouse. Prescribed fire will continue to favor blue grouse habitat to the detriment of Franklin's grouse habitat, but the extent of the affected areas are limited.

Conclusions

No units in any alternatives were designed to specifically regenerate lodgepole pine, although most regeneration harvest should initiate some new growth of lodgepole pine and benefit Franklin's grouse. All action alternatives propose some regeneration harvest in Franklin's grouse habitat. Alternative G proposes to regenerate 960 acres, thus, over time, will benefit Franklin's grouse the most. Alternative E proposes to regenerate 322 acres. Prescribed fire units will have a negative effect to Franklin's grouse because they will create open stands that provide habitat for blue grouse rather than Franklin's grouse. However, the extent of the proposed fires is very limited, so the negative effects will be minimal and most occur on warmer, drier sites that would normally provide mediocre Franklin's grouse habitat. Habitat reduced by noxious weeds is measured using new road construction as an index: Alternative E proposes no new construction and Alternative G proposes 4.9 miles.

Other Woodpeckers

Alternative A – No Action

Direct and Indirect Effects

Alternative A does not propose any timber harvests that would affect existing snags levels. Over the long term, the increased risk of insect, disease and/or wildfire problems presented by this alternative could result in an increase in small and medium size snag numbers across the watershed, but the desired large snags would still be in short supply.

Alternative E and Alternative G

Direct and Indirect Effects

The effects to existing snags are measured by a combination of harvest prescriptions that regenerate a stand, harvest systems that result in the fewest snags, and total acres proposed for harvest. Prescriptions that retain the greatest number of trees, and that use conventional, ground-based yarding operations, will generally retain the greatest number of large snags. Given Occupational Safety and Health Administration regulations for maintaining workers' safety, retaining standing large snags in harvest units can be problematic, and commercial harvest can decrease the number of standing snags. Commercial thinning or less intensive harvest usually retains more snags than harvest prescriptions that remove more trees or regenerate a stand. Cut-to-length equipment or more mechanized harvest where workers are protected by their equipment, generally result in more snags left standing than harvest that requires fallers or other unprotected labor.

Under the action alternatives, Alternative E proposes 4,606 acres of commercial harvest. Within the harvest prescriptions for this alternative, 24% of this acreage (1,098 acres) is proposed under harvest prescriptions that will most affect existing snags (shelterwood, Irregular shelterwood and clearcut with reserve trees). Alternative G proposes a higher level of commercial harvest in total (7,115 acres) as well as a higher proportion of treatments that will most affect existing snags (43% or 3,037 acres).

Thus, the number of large snags throughout the harvest units will decrease in the short-term, under either action alternative, but this decrease will be consistent with the landscape numbers obtained from unharvested plots throughout the area: scattered large snags but no or few concentrations of large snags. Between the action alternatives, Alternative G has the greater impact. The negative effects of either alternative can be minimized through careful application of the District Wildlife Tree Marking Guidelines (which call for retention of at least 4 large snags and 8 green trees per acre), careful harvest administration, and post harvest treatments to created additional snags as required.

The proposed harvest activities under both action alternatives are designed to meet the requirements in the Environmental Assessment for the Continuation of Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales and remaining snag levels are expected to usually be consistent with the Forest Plan requirements in most units unless sufficient existing trees and snags do not currently meet the requirements or if safety standards require removal. As mitigation, the Forest Service requires the creation of snags in any units that fall below Forest Plan standard required snag levels when suitable trees are present.

Effects to future snag levels depend primarily on the future condition of the stand, which is reflected in the purpose and extent of harvest. Because the South Deep project area is below the historical range of variability for late structure, all alternatives are designed to move most stands more quickly towards Structural Stage 6 than they would move without management, and no harvest is proposed in Structural Stage 6 in any action alternative. Harvest in Structural Stage 4 and 5 should move stands toward larger-tree Structural Stage 6 more quickly than without management, so should concomitantly increase the size of developing snags compared to no management. Without management, the number of small snags would increase dramatically as trees died from competition and disease, but the number of large snags would decline because few would develop in the overstocked, small-diameter stands. Therefore, effects to future snags are nearly opposite that of the effects to existing snags. Therefore, Alternative G will have the greatest long-term beneficial effect, and Alternative A the least long-term beneficial effect. Alternative G also presents the best opportunities to create structural stage 7 habitat for potential use by white-headed woodpeckers and the species they represent.

Maintaining large down wood on site is less of a problem than retaining snags. Contracts for this project will not allow removal of large non-sawtimber, thus the amount of down wood, both large and small, will increase and will not be an issue under either action alternative.

Cumulative Effects

The area considered for cumulative effects analysis consists of the Three Rivers Ranger District east of the Columbia River. Existing snags throughout the cumulative effects area were created primarily through fire and post-fire mortality, most recently through insects and disease and windstorms, and reduced by timber harvest. Many of the forested stands were initiated during fires in the 1920s and 1930s. In areas of very densely stocked trees, snag numbers might be high but standing snags of large diameter are rare or absent. Few fires have occurred in the latter half of the 20th and the 21st centuries, and none has created expansive areas of dense snag habitat.

Throughout the South Deep watershed, snags have developed and continue to develop primarily through root rot diseases, insect outbreaks and fire and post-fire mortality and reduced by timber harvest. The tree damage created during the winter storms of 1996/1997 created a great number of standing, broken, live trees. These trees will become extremely valuable as time passes because they will begin to decay and to attract insects, yet will remain standing. Additionally, because they are not considered snags under Occupational Safety and Health Administration guidelines, many more of these can remain in a stand during salvage logging activities. In the past decade, outbreaks of Douglas-fir bark beetle have created patches of snags in Douglas-fir habitats throughout the District.

Planned and completed projects have reduced or will reduce standing snag densities. Past harvest has eliminated or reduced snags, especially large snags. Past road building and the firewood policy of allowing snags to be harvested within 200 feet of open roads eliminated or continues to suppress snag levels. The proposed project will add little to the cumulative negative effects of reduced snag levels because non-sawtimber will remain on site, new roads will be closed after harvest activities (so though many of the snags within 200 feet of the roads will probably be removed by the public for firewood, the suppression will not be continuous), green trees will remain on site to develop into snags in the future, and we will create snags in units that fall below standards in the Forest Plan.

Conclusions

Snag and down wood levels overall on National Forest System lands in the South Deep watershed are similar to other areas: sufficient small snags and down wood and infrequent large snags and down wood. Many of the older harvest units and some of the densely stocked stands do not contain large snags or much large down wood. No extensive areas have concentrations of large snags similar to that caused by fire, but several stands have root rot, beetle-kill, and other impacts that continue to add larger snags and down wood to the landscape.

The analysis of effects to existing snags was based on the harvest prescriptions that regenerate a stand, harvest systems that result in the fewest snags, and total acres proposed for harvest under each alternative. Under all action alternatives, care must be taken to minimize loss of standing snags during harvest because past fires and harvest have reduced the number of large snags on the landscape. Given Occupational Safety and Health Administration regulations for maintaining workers' safety, retaining standing large snags in harvest units can be problematic, and commercial harvest can decrease the number of standing snags.

In increasing order of negative effects to existing snag numbers, Alternative A, the no action alternative, would not impact existing snags. Of the action alternatives, Alternative E proposes fewer acres of total harvest as well as fewer acres of harvest that have the greatest potential to remove existing snags (shelterwood, Irregular shelterwood and clearcut with reserve trees) than Alternative G, and would therefore have a lower impact on existing snags. The difference between these alternatives is considerable but would be minimized by following the District Wildlife Tree Marking Guideline Update.

Effects to future snags are nearly opposite that of the effects to existing snags. No harvest is proposed in Structural Stage 6 in any action alternative because the South Deep project area is below the historical range of variability for late structure. Harvest in Structural Stage 4 and 5 should move stands toward larger-tree Structural Stage 6 more quickly than without management, so should concomitantly increase

the size of developing snags compared to no management. Therefore, Alternative G will have the greatest long-term beneficial effect, and Alternative A the least beneficial effect.

The District Wildlife Tree Marking Guideline Update (1995) is in effect for South Deep watershed and will be applied in harvest units. This update requires retaining a minimum of 4 large snags and 8 replacement trees per acre, when available, to provide for 100% of the potential population of primary cavity nesters. It describes sizes and alternatives if these are not available. If the number of remaining snags does not meet the requirements in this guideline, the loss, due to harvest, can be mitigated by creating snags.

Large Raptors (and Great Blue Herons)

Alternative A – No Action

Direct and Indirect Effects

Alternative A does not propose any vegetative treatments, therefore it will have no immediate or short term impact on any known raptor nest. Over the long-term, natural forest successional processes will continue to increase stem densities in many stands, potentially increasing nesting habitat availability for raptors over current conditions. However, this alternative also creates an increased risk for insect, disease and/or wildfire that could adversely affect large areas of this watershed and reduce available raptor nesting habitat well below current levels for many years.

The No Action alternative contributes toward meeting Forest Plan direction over the short term by avoiding any vegetative treatments that may impact existing raptor habitat. Over the long term, by increasing the risk of insect infestations, disease, or wildfire, it does not contribute toward development or maintenance of health diverse forest conditions that will continue to support raptors across the landscape.

Alternative E and Alternative G

Direct and Indirect Effects

The only known goshawk nest is located within the Thomas/Hudson MA-1 area. No commercial treatments are proposed within this area under either action alternative that would affect this nest.

The Forest Plan as amended by the Continuation of Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales (Eastside Screens) established direction to set up 30-acre nest stand buffers and post-fledgling areas around known goshawk nests to regulate and mitigate impacts of timber harvest in their vicinity. Because the Thomas/Hudson MA-1 is large enough (about 661 acres) to fully contain the 30 acre buffer area and serve as the entire post-fledgling area, no additional measures are needed to protect this nest and meet established management direction.

In both action alternatives, harvest unit SDR lies adjacent to the Thomas/Hudson MA-1 area. This unit is designated for helicopter harvest. One proposed helicopter landing site is located outside of the Thomas/Hudson MA-1, on top of a ridge above the MA-1 and at the end of proposed road segment S4. The harvest units served by this landing are on the other side of the ridge from the MA-1; therefore, the potential noise disturbance from helicopter operations is minimal. No helicopter operations will fly over the goshawk nest or post-fledgling area between March 1 and September 30.

No post and pole units or precommercial thinning units are proposed within the Thomas/Hudson MA-1 under either action alternative; therefore those operations will have no impact to the nest. One small noncommercial treatment unit (ZM) is proposed in the northeastern part of this MA-1 under both action alternatives. This treatment unit is located outside of what would be needed to maintain an effective post-fledgling area and no further adjustments are necessary to avoid adverse impacts to this nest and meet Forest Plan direction.

Both action alternatives prescribe treatments potentially impacting the known Cooper's hawk nests. Commercial harvest unit DZB is near the Cooper's hawk nests at Huckleberry Mountain. Proposed activities within harvest unit DZB are not expected to directly impact either one of the nests at this location. To preserve the area surrounding the nest tree and maintain the site's suitability for use by Cooper's hawks, a 300 foot buffer zone will be established. The Cooper's hawk nest in the Gillette area is within harvest unit WGP in both action alternatives. To protect the existing nest tree and surrounding area, a 300 foot buffer will also be established at this nest. These measures will meet Forest Plan requirements for managing known nest sites (and surrounding areas) to insure their continued usefulness to Cooper's hawks.

Commercial harvest unit ECB and pre-commercial unit TBM (contained in both action alternatives) are near the red-tailed hawk nest at Big Meadow Lake. Establishing a 300 foot buffer around this nest will also satisfy the Forest Plan requirements for nest site protection.

Cumulative Effects

The Forest Plan established a habitat capability objective for raptors (and great blue heron) which recognized that raptor habitat conditions change over time and that 100% protection and maintenance of all existing raptor habitat is not possible across a managed landscape of the Colville National Forest. Forest conditions change over time. The dense, overstocked stands preferred by accipiters are subject to insect and disease outbreaks and wildfires that can radically alter available nesting habitat. Vegetative treatments, such as commercial timber harvest; controlled burning; or removing trees for other purposes such as for trails, roads or fields and other management projects, both on and off Forest Service managed lands, may impact existing raptor nests.

Under the current Forest Plan, the Colville National Forest has been quite successful in finding and protecting goshawk nests. Known nest sites for goshawks and other raptors have been and continue to be protected during timber harvest and other activities to minimize adverse impacts. In accordance with the Continuation of Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales (Eastside Screens), goshawk nests are further protected by no harvest buffer zones, establishment of post-fledgling areas, and temporal restrictions on activities when necessary. All these measures are designed to reduce any cumulative negative effect of management activities on raptor habitat Forest-wide.

Existing direction under the Continuation of Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales also directs most timber harvest activities on the Forest toward retention and establishment of late structure stands and enhancement of younger stands toward late structure conditions. This helps insure the persistence of suitable nesting habitat across the landscape for some raptors, especially goshawks, but this direction may impact potential sharp-shinned and Cooper's hawk nest habitats because it emphasizes treatments in the types of habitat preferred by those species.

Across the Forest, surveys are conducted to locate other raptor nests and protection measures are employed whenever they may be affected by an activity. Many raptor nests are probably not found, but the surveying and nest protection does reduce the overall potential for negative effects to raptors.

Within the South Deep project area, attempts have been made to locate and protect known raptor nests. Timber harvest prescriptions under the action alternatives have been designed to promote healthier, more resilient timber stand conditions that will continue to provide raptor nesting opportunities. Cumulatively, these actions contribute favorably to actions occurring on other parts of the Forest and contribute toward meeting Forest Plan direction.

Conclusions

There are no known great blue heron nests within the South Deep project area. Surveys have located 1 goshawk nest, 2 Cooper's hawk nests, and 1 red-tailed hawk nest in areas potentially affected by

proposed management activities. Protection measures to protect these nests and maintain the immediate area's suitability for use by the respective raptor species have been incorporated into both action alternatives.

Both action alternatives promote the establishment of more healthy and resilient forest habitat conditions that help maintain or enhance raptor habitat over the long term. The No Action alternative does not provide for long term raptor habitat management due to the increased risk of uncontrolled insect and fire damage.

Migratory Land Birds

Alternative A – No Action

Direct and Indirect Effects

Alternative A does not result in any management induced changes to migratory land bird habitat conditions. Over time, and in the absence of other disturbances, some existing openings, riparian areas and deciduous habitats would be expected to succumb to forest succession, and the local population levels of birds requiring these habitats would decline. Opportunities to develop large tree, single stratum (SS7) habitat in this area would not be realized.

Within the coniferous forest types, stand densities in many areas would continue to increase, as would the risk of large scale disturbances such as insect and/or disease problems or large, stand-replacing wildfires. Such a large scale disturbance would change bird habitat conditions across much of the watershed, altering both bird species abundance and diversity. Species requiring older forests and closed canopy habitat conditions would experience the greatest adverse effects over the short term.

Alternative E and Alternative G

Direct and Indirect Effects

Generally, projects that improve riparian shrub and deciduous tree conditions, or promote the future development of large tree, single stratum (SS7) habitat will provide improved nesting and foraging opportunities for the land bird species of greatest concern. Management activities (timber harvest, prescribed burning, non-commercial treatments) proposed under the two action alternatives have the potential to affect other migratory land birds. For example, individuals of some migratory bird species may benefit from the type of silvicultural treatments proposed, but the effect could be detrimental to individuals of other species. Underburning generally will provide improved shrub and forb conditions that can benefit many species, but some nests may be destroyed during spring burns. There are also trade-offs between limited disturbances over a short period (both changes in habitat conditions and direct disturbances created by management activities) to gain longer-term habitat improvement for a species. However, in general, most of these habitat changes only affect a small area relative to the overall ranges of these more common habitat types and the birds that use them, and have little effect to any species as a whole. Most of the migratory land bird species that would use the habitats present in most of the South Deep watershed are relatively common in abundance across the Forest and well distributed over much of the general region.

The only major differences between the two action alternatives is that Alternative G proposes a greater level of commercial silvicultural treatments and would result in larger created openings than Alternative E. Both action alternatives provide opportunities to improve and maintain a diversity of bird habitat conditions and create opportunities to develop large tree, single stratum (SS7) habitats over time. Underburning and timber activities are proposed only on a portion of the landscape under either action

alternative; there are places within the South Deep project area that are not proposed for any treatment during this project.

Both action alternatives also have the potential for localized direct effects on bird populations through habitat alterations and disturbance. There are likely to be some detrimental effects to individuals of a variety of migratory land bird species from early spring underburning and from timber harvest activities under either action alternative, but those effects should be considered relative to the potential greater negative effects to migratory land birds and other wildlife species from catastrophic wildfire. Avian productivity in some areas and for some species may decline. Productivity may rebound after treatment activities are completed for those species that benefit from the habitat alteration or remain lower for those species not favored by that habitat alteration. Alternative G also would have the greatest direct effect on existing bird habitat conditions and populations because more area is treated, however it also has the potential to provide a higher level of habitat diversity over the long term. Neither action alternative is expected to eliminate or substantially reduce any existing bird habitat conditions or species from the general area. Standard safeguards and mitigation measures to protect riparian areas apply to both action alternatives.

Under both alternatives, burning of noncommercial unit ZU has the potential to impact higher elevation sagebrush habitat. These areas are limited on the Forest and may provide specialized habitat for some bird species. Fire personnel will work closely with wildlife personnel on the prescription for burning unit ZU to minimize the mortality of sagebrush.

Cumulative Effects

Within the South Deep watershed, migratory land bird habitat conditions have been affected by a wide variety of management activities. Some activities, primarily on what are now private lands, have eliminated historically forested areas, resulting in varying degrees of fragmentation when compared to historical conditions. Fire suppression has reduced much of the natural habitat diversity that occurred across this watershed. Exotic plant and animal species have successfully invaded this area as a result of some human activities. Currently, much of the riparian habitat in the planning area is altered from historical conditions, especially on other ownerships. Livestock grazing has been introduced on both private and public lands. Parts of three National Forest grazing allotments occur within this watershed. They are known as Aladdin, Meadow Creek and Smackout allotments. Numerous timber management projects have occurred in this watershed over the last 30 years and others are expected to occur in the reasonably foreseeable future. Recreational activities and numerous other small projects (for example, trail reconstruction/relocation or repairing OHV damage) that may impact individual nests have also occurred and will continue in the future.

The cumulative effects of all these activities have been proportionally greater in those habitat that historically have been transitory in nature and/or in limited supply such as openings, shrub fields, riparian habitat, early successional forests, and single stratum forest types than in the general coniferous forest environment. Current and future management activities that maintain or improve these types of habitats contribute cumulatively to the perpetuation of bird species that require these conditions and the maintenance of the area's bird species diversity. Activities that do not maintain or improves these habitats do not contribute cumulatively to maintenance of existing habitat and species diversity.

For the alternatives under consideration in the South Deep Management Project, Alternative A (No Action) does not contribute to the long-term maintenance of existing land bird habitats. Both action alternatives provide opportunities to maintain and improve existing habitat conditions, restore under-represented habitat such as large tree, single stratum forest stands, openings and shrub fields, and promote healthier, more resilient forest conditions across the watershed.

Conclusions

Alternative A (No action) has the potential to affect land bird habitat conditions over the long term by reducing existing habitat diversity through either a) continued forest succession (the "no future

disturbance” scenario) or b) increasing the potential for large scale insect, disease and/or wildfire events that could adversely impact unique and under-represented habitat types and result in large, relatively homogeneous forest conditions.

Both action alternatives are designed to promote healthier, more resilient forest conditions within the watershed. Over the long term, existing bird habitat and species diversity should be maintained and improved. Alternative G prescribes a higher level of commercial silvicultural activities than Alternative E, and therefore has potentially higher levels of direct effects to land birds as a result of project activities and habitat alterations over the short term.

Waterfowl

Alternative A – No Action

Direct and Indirect Effects

Alternative A does not propose any timber management activities. It will not have any additional impact to waterfowl, including cavity nesting species, over the short term. Existing maintenance and recreational activities at Big Meadow Lake and elsewhere that could potentially disturb or displace nesting waterfowl will continue.

Over the long term, changes in forest conditions due to succession or large scale disturbances could alter the availability of snags and other suitable nesting trees in the vicinity of these wetlands.

Cumulative Effects

Existing recreational and maintenance activities in this area will continue but not add any new effects. Alternative A does not propose any new timber harvest; therefore it will not directly cause any further reductions in snag and cavity tree availability.

Alternative E and Alternative G

Direct and Indirect Effects

Management activities proposed in the South Deep project will have little effect on most waterfowl. However, cavity nesting ducks or their nesting habitat may be impacted by timber management activities.

Both action alternatives propose timber management activities that could alter existing and future snag and cavity tree densities and distribution, especially near Big Meadow Lake. Application of District Snag Marking Guidelines and Best Management Practices for timber harvest should minimize most potential impacts near wetland areas. Additional site-specific mitigation (see below) is proposed to further reduce potential impacts to snag and cavity tree availability in the vicinity of Big Meadow Lake. Application of these measures will insure that Forest Plan direction to maintain or enhance waterfowl habitats is followed.

Cumulative Effects

Existing potential impacts to cavity nesting waterfowl in the South Deep watershed, especially around Big Meadow Lake and its associated wetlands, include disturbances from recreational activities (including firewood harvest), Forest Service personnel or contractors' activities such as cutting hazard trees, fence construction, clearing trails, etc. Past effects include timber harvests and road construction activities that reduced overall snag and cavity tree availability.

The projects proposed under the two action alternatives in the South Deep Management Project may add cumulatively to these effects by conducting additional management activities that could disturb nesting waterfowl and further reducing existing and potential snag and cavity tree availability. The management direction incorporated into the management prescriptions will help minimize these effects and retain the area's suitability as waterfowl nesting habitat.

Conclusions

The Forest Plan Standards and Guidelines provide direction to maintain or enhance waterfowl habitats. The waterfowl habitat component of greatest concern in the South Deep Management Project area is large snag and cavity tree habitat within the vicinity of Big Meadow Lake and other wetlands to provide for cavity nesting waterfowl. Alternative A (No Action) does not directly cause any further reductions in this habitat component. District Snag Marking Guidelines, Best Management Practices, and additional mitigation prescribed for both action alternatives insure that this habitat component will be retained to provide habitat for these species.

4.2.7 Fisheries: Effects of the Alternatives

The following fisheries analysis is derived from the Fisheries Report for the South Deep Management Project and is available for review in the analyses file at the Three Rivers Ranger District office.

Alternative A - No Action

Direct and Indirect Effects

Alternative A is not expected to prevent or retard movement toward achievement of Inland Native Fish Strategy Riparian Management Objectives on any of the streams within the project area. With no timber harvest actions proposed on National Forest System lands, existing stream and riparian habitat conditions on the Forest are expected to remain stable or increase slightly.

Water Temperature

Water temperature and flow regimes are expected to remain stable. Limited samples of water temperatures did not meet the Inland Native Fish Strategy Riparian Management Objectives, but did meet state water quality standards. This alternative would not contribute to raising water temperatures of South Fork Deep Creek or its tributaries during the summer months, since the function of the riparian vegetation, including shading, would increase as stocking levels and tree heights increased. Vegetation in both riparian and upland areas on National Forest System lands would continue to mature and the percentage of the watershed in open condition would decrease. These changes in vegetative cover would lead toward a more natural flow regime with close to natural summer flows and water temperatures.

Water Quality

Water quality is also expected to remain stable. Soil movement into streams from streambank erosion and other sources, especially roads, would continue at existing levels. With cattle grazing continuing at existing levels and seasons of use, water quality is expected to remain at existing levels on streams used for grazing over the next 10-15 years. Transitory range for livestock would continue to disappear as older regeneration harvest units become mature and shade out much of the understory vegetation. Grazing pressure may increase along roads, meadows, and the accessible portions of streams and wetlands.

Large Instream Wood and Bankfull Width/Depth Ratio

Instream wood levels and bankfull width/depth ratios are expected to continue to meet Inland Native Fish Strategy Riparian Management Objectives.

Embeddedness

Embeddedness levels were high in a majority of the reaches surveyed in the project area. Soil movement from riparian areas overutilized by livestock, roads, and other sources into streams is expected to remain at existing levels and would continue to have an effect on aquatic habitat.

Pool Frequency

Pool frequencies currently do not meet Inland Native Fish Strategy Riparian Management Objectives on the majority of surveyed streams in the watershed. Pool frequencies would remain stable or slightly improve within the project area as riparian vegetation matured and contributed additional instream wood, which is important in pool formation.

Fish Populations

Fish populations would continue to be represented primarily by eastern brook and rainbow trout, which are tolerant of degraded stream conditions (low pool frequencies, high embeddedness levels). Westslope cutthroat trout populations are located in the higher gradient stream segments where stream and riparian habitat conditions are less degraded; the trend of these subpopulations is unclear, but no long-term expansion of these subpopulations is expected. A culvert currently blocking fish passage, where the Rocky Creek Road (National Forest road 701800) crosses Rocky Creek, would not be replaced.

Cumulative Effects of Timber Harvest on Other Ownerships

Logging would continue on private lands in South Fork Deep Creek tributaries. Forest Practices Applications between April of 2002 and December of 2005 indicate that timber harvest may occur on 4,639 acres (1,740 acres harvested per year) in the analysis area. Since logging on private lands must comply with state forest and fish rules, there is some level of protection of riparian habitat along fish-bearing perennial streams to ensure a source for future large wood entering the streams and reduce sediment input along these streams. However, a reduction in riparian vegetation on intermittent and non-fish bearing perennial streams is expected. There will also be an increase in state and private land acres in an open condition within the analysis area.

Cumulative Effects on Riparian Management Objectives

Riparian Vegetation

The function of riparian vegetation to act as a filter for sediment, contribute detritus and large instream wood, provide shade, and stabilize streambanks is anticipated to decrease slightly from existing levels on private and state lands. New stream crossings on private and state lands will eliminate riparian vegetation within the road corridor, but these areas are minor when compared with the overall existing vegetation. These new openings may be used by livestock. Riparian vegetation would continue to mature and become more functional on past units with riparian harvest on all ownerships.

Water Temperature

Stream flows would not change substantially from existing levels. A reduction in riparian vegetation on intermittent and non-fish-bearing streams and an increase in acres in an open condition on state and private lands would continue. This may have an effect on future water temperatures in the lower reaches

of Meadow Creek, Rocky Creek, and South Fork Deep Creek. However, since the function of the majority of the riparian vegetation in the watershed would not change, summer water temperatures would not noticeably change on most streams in the analysis area.

Large Instream Wood

Large instream wood recruitment would not change substantially from existing levels. Reductions in riparian vegetation along non-fish-bearing streams and road stream crossings would reduce available large instream wood recruitment in the future on private and state lands. However, numbers of large instream wood are expected to remain stable on the National Forest.

Embeddedness and Pool Frequency

Embeddedness and pool frequency would not change substantially from existing levels. Sediment from harvest activities on private and state lands may increase the filling of pools in low-gradient streams in the analysis area. Use of existing roads, grazing in riparian areas, and recreational use will continue to be sources of sediment, in addition to natural levels of erosion. However, with protection of fish-bearing perennial streams on all ownerships, and no harvest activity on National Forest System lands in the watershed, pool frequency is not expected to noticeably change on streams in the analysis area. Sediment filling of streambed substrates and pools in low-gradient segments of streams is expected to continue.

Bankfull Width/Depth Ratio

Channel morphology would not change substantially from existing levels. Existing road use and grazing on National Forest System lands, with sediment from new road crossings and riparian harvest on private and state lands, would continue to accumulate in the lower gradient sections of stream habitats in the watershed.

Fish Populations

Overall, instream habitat quality is anticipated to decrease slightly over existing levels. A decrease in riparian function would potentially decrease the quality of adjacent and downstream fish habitat through an increase in embeddedness of the substrate, increase of the bankfull width/depth ratio, and a decrease in habitat complexity due to lack of instream wood.

Alternative E

Direct and Indirect Effects

With the exception of existing road reconstruction and decommissioning, no timber harvesting activities are proposed within riparian habitat conservation areas of streams within the analysis area. None of the temporary roads proposed in Alternative E would cross streams or be located within riparian habitat conservation areas. Best management practice PT-7 Riparian Habitat Conservation Area Designation and Protection (Appendix C) would be applied to the proposed road work.

Road segments to be reconstructed for timber harvest include 55 stream crossings. Light and moderate reconstruction of 54 crossings is expected to remain within the existing corridors through the riparian vegetation. Four of these 54 crossings, in the headwaters of Rocky Creek, would have the existing culverts replaced. One heavily reconstructed crossing, at the end of the South Fork of Rogers Creek (an intermittent segment) would require replacement of the existing culvert and possibly a slight widening of the crossing area. Heavy reconstruction of a portion of Forest Service Road 7018000 where it crosses Rocky Creek, including the replacement of the existing culvert, would be done as a separate activity from the timber harvest. This culvert is currently blocking fish passage.

Road decommissioning would allow six existing stream crossings to return to natural vegetative shade conditions (see Table B-6, Appendix B). Three sites on Meadow Creek and Rocky Creek have either had the crossing structures removed or are inaccessible to machinery. Three other sites on Kenny Creek and Thomas Mountain would have the culverts removed and the stream channels restored (on National Forest System roads 7000775 and 7005790).

Riparian Vegetation

The small amount of vegetation to be removed is not anticipated to diminish the overall capability of the remaining riparian vegetation to provide shade and moderate stream temperatures in each subwatershed. Removal of riparian vegetation at two heavily reconstructed stream crossings would eliminate its function and create a new source of sediment input. Application of road best management practices would reduce the potential sediment input and the effects to fish habitat. Revegetation with grasses and riparian species would not totally replace the existing function of the riparian vegetation as a filter for soil movement, but would reduce surface erosion. This alternative would not affect the function or quantity of riparian habitat in the mainstem of South Fork Deep Creek.

Water Temperature

The timber harvest activities proposed in this alternative are not expected to prevent or retard movement toward achievement of water temperature objectives on streams in the analysis area. The proposed harvest, together with existing harvest on all ownerships, would not exceed the Equivalent Clearcut Acreage threshold of 25% in any individual subwatershed (see section 4.1.2 Hydrology). The Equivalent Clearcut Acreage percentage would gradually decrease due to vegetative regrowth in former harvest areas. The effects of the proposed harvest and temporary road construction on the subwatersheds in the analysis area are not expected to imbalance the existing flow regimes, lower summer flows, or increase summer water temperatures.

Large Instream Wood, Embeddedness, Pool Frequency, and Bankfull Width/Depth Ratio

At 50 of 56 existing stream crossings, no riparian vegetation would be removed outside of the existing crossing corridor. A small amount of vegetation would be removed to replace culverts at six stream crossings. This action is not anticipated to diminish the recruitment source of large instream wood into the streams. There would still be adequate instream wood to help create and preserve pool habitat, to stabilize stream channels, and to provide fish foraging habitat in streams in the analysis area. The effect on large instream wood in South Fork Deep Creek would be negligible, as most large wood within its tributary streams does not reach the South Fork.

Riparian habitat conservation areas would adequately filter out any soil movement from most of the proposed road reconstruction activities. Sediment input may occur at six reconstructed stream crossings where culverts would be replaced. The amount of increase in sediment is not known but is expected to be greatest during reconstruction. This initial increase is expected to disperse further downstream, since these road crossings are not located within or immediately above a low-gradient reach. Sediment could fill interstitial spaces within spawning gravels and other substrates that are hiding cover for fry and juvenile fish and habitat for macroinvertebrates. Rocking of the reconstructed stream crossings, compliance with Washington Department of Fish and Wildlife Hydraulic Permit Approval requirements, and road best management practices are expected to reduce any soil movement into the streams during and after sale activities. Any sedimentation from riparian road reconstruction is expected to be reduced after the proposed activity occurs and the sites are revegetated. The effect of this contribution to South Fork Deep Creek is likely to be minor as compared with the background level of erosion and other contributors to embeddedness, particularly from roads throughout the watershed.

No new stream crossings are proposed in this alternative, and there would be no new access points for cattle into riparian areas from this alternative.

Any increase in sediment levels may fill existing pools, particularly on the low-gradient segments of these streams. This alternative is anticipated to slightly reduce the quality and/or quantity of pool habitat in South Fork Deep Creek due to the slight increase in sediment introduction from activities in the riparian areas of its tributaries.

No increases in bankfull width/depth ratios are anticipated from the proposed actions. Minor changes in channel morphology could occur as a result of sediment input from reconstructed stream crossings, but road best management practices would reduce the potential of project-related increases in bankfull width/depth ratios. Aggradation of the channel is not anticipated to occur below these sites.

Fish Populations

Any effects to fish habitat would be isolated and limited to low-gradient reaches downstream of the two heavily reconstructed stream crossings. Riparian habitat conservation areas would filter out overland soil movement from activities elsewhere in the analysis area. Five culverts to be replaced are located on non-fish bearing streams and would have no effect on fish passage. Replacement of the culvert on the Rocky Creek Road (7018000) would restore fish passage. Water temperatures would remain suitable for the salmonid species inhabiting the streams in the analysis area.

Fish populations would continue to be represented primarily by eastern brook and rainbow trout, which are more tolerant of the degraded instream conditions (low pool frequencies, high embeddedness levels) in the lower-gradient segments. Westslope cutthroat trout populations would continue to be located in the higher-gradient segments where stream conditions are less degraded. Since sediment from the proposed activities in the Rocky Creek subwatershed are expected to accumulate in low-gradient reaches, any habitat change would affect eastern brook trout, which is more tolerant of high embeddedness levels. No long-term reductions in these subpopulations are expected.

Alternative G

Direct and Indirect Effects

With the exception of new road construction, reconstruction, and decommissioning, no timber harvest activities are proposed within riparian habitat conservation areas of streams within the analysis area. As part of new classified road construction, two new stream crossings on intermittent streams (Kenny Creek and an unnamed tributary to South Fork Deep Creek) would be constructed. None of the temporary roads proposed in Alternative E would cross streams or be located within riparian habitat conservation areas.

Road segments to be reconstructed for timber harvest include light reconstruction of 24 stream crossings and moderate reconstruction of 48 stream crossings, which are expected to remain within the existing corridor through the riparian vegetation. Four of the 48 crossings would have the existing culverts replaced. The proposed heavy reconstruction includes three crossings where culverts would be replaced and the crossing area may be widened slightly: a fish-bearing stream (Rocky Creek), a non-fish bearing stream (South Fork Clinton Creek), and an intermittent stream. Heavy reconstruction of a portion of Forest Service Road 7018000 where it crosses Rocky Creek, including the replacement of the existing culvert, would be done as a separate activity from the timber harvest. This culvert is currently blocking fish passage.

As in Alternative E, road decommissioning would allow six existing stream crossings to return to natural vegetative shade conditions (see Table B-6, Appendix B). Three sites on Meadow Creek and Rocky Creek have either had the crossing structures removed or are inaccessible to machinery. Three other sites on Kenny Creek and Thomas Mountain would have the culverts removed and the stream channels restored (on National Forest System roads 7000775 and 7005790).

Riparian Vegetation

Effects would be similar to Alternative E, with the removal of riparian vegetation occurring at two new stream crossings and four heavily reconstructed stream crossings. The small amount of vegetation to be removed is not anticipated to diminish the overall capability of the remaining riparian vegetation to provide shade and moderate stream temperatures in each subwatershed. As in Alternative E, this alternative would not affect the function or quantity of riparian habitat in the mainstem of South Fork Deep Creek.

Water Temperature

The effects of timber harvest activities proposed in this alternative are potentially greater than in Alternative E, but are not expected to prevent or retard movement toward achievement of water temperature objectives on streams in the analysis area. The proposed harvest, together with existing harvest on all ownerships, would only exceed the Equivalent Clearcut Acreage threshold of 25% in the Meadow Creek subwatershed (see section 4.1.2 Hydrology). This exceedence would only occur if all the timber harvest were completed in one year, which is unlikely. Timber harvest over several years would be tempered by the continued growth of vegetation in the Meadow Creek subwatershed. No new road construction is located in the Meadow Creek watershed. Regardless of whether the 25% level is temporarily exceeded, the Equivalent Clearcut Acreage percentage would continue to decrease due to vegetative regrowth in former harvest areas. As in Alternative E, the effects of the proposed harvest and new road construction on the subwatersheds in the analysis area are not expected to imbalance the existing flow regimes, lower summer flows, or increase summer water temperatures.

Large Woody Debris, Embeddedness, Pool Frequency, and Bankfull Width/Depth Ratio

Effects would be similar to Alternative E, with additional culvert replacements and stream crossings proposed in Alternative G. At 62 of 76 existing stream crossings, no riparian vegetation would be removed outside of the existing crossing corridor. A small amount of vegetation would be removed to replace culverts at eight stream crossings, and install new culverts at two new stream crossings. As in Alternative E, the effect on large instream wood in South Fork Deep Creek would be negligible, as most large wood within its tributary streams does not reach the South Fork.

Effects of road reconstruction on sediment delivery and stream substrate embeddedness would be similar to Alternative E, with additional culverts being replaced in Alternative G. Sediment input may occur at eight reconstructed stream crossings where culverts would be replaced. Rocking of the reconstructed stream crossings, compliance with Washington Department of Fish and Wildlife Hydraulic Permit Approval requirements, and road best management practices are expected to reduce any soil movement into the streams during and after sale activities. The effect of this contribution to South Fork Deep Creek is likely to be minor as compared with the background level of erosion and other contributors to embeddedness, particularly from roads throughout the watershed.

One new stream crossing, on Kenny Creek, is proposed within an active livestock allotment. Typical impacts include soil compaction and bank trampling, which can become a consistent source of sediment into the stream. However, the access point would be on an intermittent stream with very limited riparian vegetation. This area may not contain water in June when cattle are allowed on the allotment.

The other new stream crossing is proposed on an unnamed tributary to the South Deep Creek watershed. Since there is no cattle allotment in this subwatershed, there would be no effect on cattle access.

Any increase in sediment levels may fill existing pools, particularly on the low-gradient segments of these streams. This alternative is anticipated to slightly reduce the quality and/or quantity of pool habitat in South Fork Deep Creek due to the slight increase in sediment introduction from activities in the riparian areas of its tributaries.

No increases in bankfull width/depth ratios are anticipated from the proposed actions. Minor temporary changes in channel morphology could occur as a result of sediment input from new and reconstructed stream crossings, but road best management practices would reduce the potential of project-related

increases in bankfull width/depth ratios. Aggradation of the channel is not anticipated to occur below these sites.

Fish Populations

Effects of this alternative would be similar to Alternative E, with additional crossings being treated in Alternative G. Two new culverts and seven culvert replacements would be located on non-fish bearing and intermittent streams and would have no effect on fish passage. Replacement of the culvert on the Rocky Creek Road (7018000) would restore fish passage. Water temperatures would remain suitable for the salmonid species inhabiting the streams in the analysis area. Sediment contributions from the proposed actions are likely to be minor as compared with background levels. No long-term reductions in eastern brook, rainbow, or westslope cutthroat trout subpopulations are expected.

Alternatives E and G

Cumulative Effects

Planned timber harvest and road construction on private and state lands will increase created openings and the road drainage system within the analysis area.

Riparian Vegetation

New stream crossings on National Forest System lands would cause a slight decrease in functional riparian vegetation, primarily along intermittent and non-fish-bearing streams. A majority of the decrease in riparian vegetation would occur at new crossings. The effect of this decrease in riparian vegetation on National Forest System lands, considered with decreases in riparian vegetation due to logging and road construction on private and state lands, is minor compared with the remaining riparian vegetation, and the riparian vegetation that will continue to mature in past units on National Forest System lands and other ownerships. The function of riparian vegetation for shade, bank stability, detritus, large instream wood, cover and to filter out soil movement should continue to be adequate on National Forest System lands in the analysis area.

Water Temperature

No downstream cumulative effects to stream temperatures are anticipated to occur under either action alternative, since Inland Native Fish Strategy riparian habitat conservation areas will remain intact and undisturbed except for limited riparian vegetation disturbance during construction and/or reconstruction of stream crossings. Alternative E would only reconstruct existing stream crossings. Alternative G would construct new two road/stream crossings in addition to reconstructing existing crossings. Downstream cumulative effects to temperature would be minimal and undetectable using standard monitoring techniques. Stream temperatures along the mainstem of South Fork Deep Creek would likely continue to exceed state water quality standards because of the lack of overstory riparian vegetation along those stream reaches and anticipated activities on private and state lands.

Large Woody Debris, Embeddedness, Pool Frequency, and Bankfull Width/Depth Ratio

Road construction and reconstruction within riparian areas on National Forest System lands may cause a slight decrease in large instream wood recruitment into certain segments of streams. This decrease in wood contribution would be in addition to the decrease in potential large wood from logging on private lands. The availability of large instream wood for cover, foraging habitat, sediment collection, and pool formation would continue to be adequate for fish populations on National Forest System lands and is not expected to affect its supply or availability on private lands within the analysis area.

New road construction and reconstruction of stream crossings would cause an increase in sediment introduction into certain low-gradient segments of streams within the project area. These sediment sources, in addition to any contribution of sediment from logging on private lands, may increase the embeddedness level of streambed substrate and filling of pool habitat on low-gradient sections located downstream of these activities. Both action alternatives are likely to have a cumulative effect to pool habitat on the lower gradient reaches of Rocky Creek and South Fork Deep Creek.

Riparian habitat conservation areas would filter overland soil movement from upland timber harvest, which would protect streambank integrity and prevent stream channel modification. New and reconstructed stream crossings on National Forest System lands may modify stream segments within the crossing corridor. Any modification of the existing bankfull width/depth ratio at stream crossings would be located primarily in intermittent and non-fish-bearing streams. These proposed actions on National Forest System lands, considered with stream conditions affected by private logging and road building, would not detrimentally affect functioning channel habitat in each subwatershed.

Fish Populations

New construction and reconstruction of stream crossings on National Forest System lands would decrease the riparian vegetation along a few stream segments in the analysis area. An increase in sediment introduction at these few sites would occur as well. These effects, in addition to any decrease in riparian vegetation and increase in sediment input due to past and future logging and road construction on state and private lands, would decrease the quality of fish habitat adjacent to and downstream of the activities. Riparian vegetation would continue to mature and become more functional on past units on National Forest System lands and other ownerships. The function of riparian vegetation for shade, bank stability, detritus, large instream wood, cover and to filter out soil movement should continue to maintain adequate habitat for fish populations on National Forest System lands within the analysis area. However, fish habitat on the lower gradient reaches of the analysis area will continue to accumulate sediment from all ownerships. This accumulation of sediment would maintain the poor quality and limited quantity of spawning and rearing habitat in these lower reaches.

4.3 Human Environment

4.3.1 Heritage Resources: Effects of the Alternatives

The following heritage analysis is derived from the Heritage Report for the South Deep Management Project and is available for review in the analyses file at the Three Rivers Ranger District office.

Alternative A – No Action

Direct and Indirect Effects

There would be no change from current conditions. Heritage sites would continue to gradually deteriorate over time, subject primarily to natural forces.

Alternatives E and G

Direct and Indirect Effects

Timber harvest and fuels reduction activities have the potential to damage heritage sites directly by heavy machinery, falling trees, road building, fuels treatments, etc., or indirectly as a result of discovery and increased access to each site.

Units in Alternative E contain 10 management class 2 sites, while units in Alternative G contain 16 management class 2 sites. Because management class 2 sites must be protected and preserved as is, Alternatives E and G would mitigate potential impacts by one of two options. Either provisions must be made to avoid direct impacts to the site during the planned activities (e.g. delete entire unit or a sufficient amount of the unit to avoid impacts to the site) or if it is determined this is not a viable option, a plan for mitigating the adverse effects to the site must be developed with the Heritage staff. There are several mitigation options that can be explored including, research, interpretation, public education, site enhancement or a combination of these and other options. The State Historic Preservation Office concurs with these actions.

Having a buffer left around each one of the sites will protect the management class 2 sites. The size of the buffer will vary based on site-specific circumstances dealing with yarding methods and site vulnerability. With the buffering, each site will be protected. This will reduce the volume available in each unit by a small amount, and may influence how the logs are yarded adjacent to each site.

Cumulative Effects

Under No Action Alternative (A), the continued buildup of fuels from downed woody debris and from the density of trees could cause an adverse effect to historic properties. Unchecked fire within the planning area would destroy standing and downed historical structures, affecting National Register eligibility characteristics of these historic properties.

Under Alternatives E and G, historic properties within the planning area will experience minimal cumulative effects. Effects may include increased access to historic properties due to road re-opening or new road building. Proper buffering and maintenance of confidentiality of historic properties locations will effectively reduce these possible impacts.

Cumulative past, present, and foreseeable future effects within the planning area may have either negative or positive effects. Potential negative effects from all actions may include increased access and visibility of historic properties. Potential positive effects from activities associated with the above alternatives within the planning area may be beneficial in that continued treatment of heavy fuels and overstocked timber stands could protect historic properties from unchecked wild-land fire.

4.3.2 Scenery: Effects of the Alternatives

The following scenery analysis is derived from the Scenery Report for the South Deep Management Project and is available for review in the analyses file at the Three Rivers Ranger District office.

This section addresses the effects of the proposed project on the scenic qualities of the project site. Policies for protection and enhancement of the scenery resource are contained in the Colville Forest Plan in the section titled "Visual Resource Management".

This analysis focuses on the effects of management activities on the natural appearing characteristic landscape as seen from critical viewpoints.

The primary criteria for determining the effects of the alternatives are the Visual Quality Objectives that would result from the proposed actions⁶. In order to determine the achievement of a specified Visual Quality Objective, we evaluate the proposed alterations in relation to the existing natural-appearing landscape in terms of scale, size, and extent; and in relation to the amount of contrast in form, line, color and texture, as observed from critical viewpoints. Views from critical viewpoints are divided by distance zones: foreground (0 - 1/2 mile); middleground (1/2 – 5 miles); and background (5 miles – horizon). This method relies primarily on professional judgment because there are no quantifiable interval measurements that can be used as thresholds. Failure to achieve the specified VQO is an "adverse" effect; achievement of the VQO is a "neutral" effect; and achievement of a higher VQO is a "beneficial" effect. VQOs and their definitions are as follows:

- **Retention**: Management activities/human alterations should not be visually evident to the casual visitor.
- **Partial Retention**: Management activities/human alterations should remain visually subordinate to the natural appearing landscape.
- **Modification**: Management activities/human alterations may visually subordinate the natural appearing landscape, but they must borrow form line, color and texture from that characteristic landscape.

Alternative A – No Action

Direct and Indirect Effects

No negative visual impacts would occur as no activities would be initiated. However, if overstocked stands remain untreated, in time these stands would become susceptible to insect/disease and uncontrolled wildfire, thus reducing the scenic integrity of the area. Opportunities to move the landscape back into the Historic Range of Variability (ecological sustainability) would be foregone.

Alternatives E and G

Direct and Indirect Effects

Treatment of the vegetation on National Forest System lands within the South Deep project area, at a broad scale, whether through timber harvest or non-commercial means, would perpetuate the desirable attributes of the existing landscape character. Activities that treat vegetation at the landscape scale, without the introduction of long-term negative visual elements, would meet the objectives of the Forest Plan. With appropriate design measures (described below), temporary roads, skyline corridors, and harvest debris would not take away from the valued landscape character of the National Forest System lands.

The following proposed activities would meet their respective Partial Retention and Modification Visual Quality Objectives (as seen from critical viewpoints, discussed in section 3.3.2 Scenery) in both action alternatives: precommercial thinning; post and pole; fuels reduction treatments; and some commercial harvest (silvicultural prescriptions of irregular shelterwood, single-tree selection, sanitation, and retention system). These activities retain the mature forest canopy as seen in middleground or background with only textural changes in the canopy, thus allowing them to meet respective Visual Quality Objectives (VQOs). Fuel reduction areas would meet VQOs, as overstory trees would screen middleground views of blackened ground surfaces; green-up would occur the following spring.

Some commercial harvest units (with silvicultural prescriptions of shelterwood and clearcut with reserves) and some precommercial thinning units in visually sensitive areas were modified to address scenery

⁶ When the current Forest Plan was developed, the Visual Management System (VMS) was the basis for scenery assessment. In the near future when a new Forest Plan is developed, the Scenery Management System will be incorporated and will include new elements such as ecological sustainability and positive cultural attributes.

concerns. The following measures would be applied to ensure the proposed treatments meet VQOs for the project area:

- Precommercial thinning units that have portions located in the near foreground of the Meadow Creek Road will have slash that is visible from the road removed or pulled back (50 ft.) into the unit. This would be applied to units TAZ, TBA, TBD, TBH, TBL, TBM, TBP, TBW.
- Cable logging system: keep cabled corridors as narrow as possible to reduce contrasting line effects; orient away from Aladdin Highway where possible; and retain rub trees. This would be applied to units DBH, DBJ, DBS, DCA, DCG, DCO, ECC, ECH, ECL, NBI, NBN, NBO, SDH, SDI, WGL.
- Created opening: use irregular shaped openings (no straight lines or corners) with grouped leave tree islands to reduce visual contrasts; and limit the size of created openings to no more than 10 acres (to reduce soil color contrast). This would be applied to units NBE, NBO, SDG, SDH, WFQ.
- Canopy texture: retain 25-30 leave trees/acre, thus maintaining enough forest canopy to meet the Visual Quality Objective (leave trees may be grouped or clumped). This would be applied to units DCG, DCK, ECH, ECL, NBI, NBN, SDB, SDH, WFL, WFS, WFX, WGG, WGJ, WGL (30-35 leave tree density to screen upper portion of unit), WGP.
- Boundary line: retain trees along the boundary between private and National Forest System lands in an irregular, feathered, undulating pattern to reduce the impacts of the straight line effect of the boundary. This would be applied to units DBS, DCA, DCO, ECB, ECC, ECE, ECH, NBT, WFL, WFS, WFLV, WGL, WGN, WGO, WGQ.
- Transmission line rehabilitation: remove trees along the transmission line clearing in an irregular, feathered, undulating pattern to soften and blend the negative line effect. This would be applied to units DGA, DGB, NBN, NBQ, NBV, NBW.
- Foreground screening: mitigation would include retaining trees in an irregular, feathered pattern on the lower edge of the unit to screen views into the unit from the roadway, trail, or lake. This would be applied to units DBU, DCB, DCC, DCI, ECG, WFL, WFS, WGL, WGN, WGO, WGQ.

Light and moderate road reconstruction and temporary road construction would meet middleground Partial Retention and Modification VQOs, due to their light impacts and topographic and/or vegetative screening (including those slopes greater than 45%).

Heavy road reconstruction and new road construction, where topographic and/or vegetative screening is absent (and located on slopes > 45%) would be mitigated. The following measures would be applied to ensure these activities meet middleground Partial Retention and Modification VQOs:

- Road Construction / Heavy Reconstruction screening of road cuts and fills: retain vegetation below the road; adjust the road location to utilize unseen topographic benches; and avoid locations on >45 % slopes where visual exposure would occur for more than ¼ mile. The following are road segments where these measures would be applied: 7000660, E4, E10, N12, W1.

Views from the Roger's Mt. Trail and Little Pend Orielle Trail would not be impacted by proposed activities.

Comparison of Alternatives

Alternatives E and G differ in the degree to which the proposed activities address long-term sustainability of the characteristic landscape. Alternative E addresses scenery concerns primarily by eliminating or reducing potential impacts from road construction and heavy road reconstruction. However, if an ecologically sustainable, forested landscape is the desired future condition, then Alternative G, which moves more acres more quickly towards that future condition, would better meet this objective.

Proposed activities in both action alternatives (in combination with the existing visual impacts) would not substantially impact the overall scenic integrity. Impacts would meet the Visual Quality Objectives for the project area. Over the long term, the landscape character would begin to move back toward its earlier

character (before extensive fire suppression, within the Historic Range of Variability) of a more sustainable, open forest canopy with much less dense understories.

Cumulative Effects

Reasonably foreseeable future actions in the South Deep watershed are land management actions by private, state and other landowners. Timber harvesting activities on other ownerships may vary from thinning to even-aged harvest. Although the scenic quality along travel routes, such as the Aladdin Highway, could be impacted by actions on other ownerships, scenic quality on the National Forest System lands would not be affected. National Forest System lands would continue to meet the visual quality objectives for the project area.

4.3.3 Recreation: Effects of the Alternatives

The following recreation analysis is derived from the Recreation Report for the South Deep Management Project and is available for review in the analyses file at the Three Rivers Ranger District office.

Alternative A – No Action

Direct and Indirect Effects

The South Deep watershed is valued as a local resource for camping, hunting, and fishing, and gathering berries, mushrooms and firewood. The No Action Alternative would have no direct effect on recreational uses in the area. The risk of larger-scale wildfires would continue to increase over time, with accumulations of surface and ladder fuels as vegetation continued to mature. Larger wildfires, which typically occur during the summer, would coincide with higher levels of recreational use in the project area and would potentially impact more people. However, these events are not predictable. A larger-scale wildfire produces more smoke than smaller, controlled prescribed burns, primarily due to the timing. A larger-scale wildfire, with associated fire control actions, would displace people from the vicinity of the burn.

Cumulative Effects

Concerns about altering recreation opportunities in the South Deep watershed were expressed in scoping comments on the project. Their concerns indicate that there has been little change in recreation opportunities in recent years and users want to retain these opportunities unchanged.

Reasonably foreseeable future actions in the South Deep watershed are land management actions by private, state and other landowners. Although the quality of recreational experiences (such as scenery, discussed in the previous section) could be impacted by these other actions, they are not anticipated to alter recreational use in the project area. The desired ROS areas identified within the project area would remain unchanged by the cumulative effect of these reasonably foreseeable actions and the No Action alternative.

Effects Common to Alternatives E and G

Direct and Indirect Effects

The desired Recreational Opportunity Spectrum areas identified in the South Deep watershed would be unaffected by the actions proposed in the action alternatives. Dispersed recreation (such as hunting and fishing, recreational driving, berry picking, mushrooming, and firewood gathering) would be temporarily displaced from harvest units (and possibly log haul routes) for the duration of the timber harvest activities. However, due to the temporary nature of the activities, it is expected that no long-term alteration of recreational use patterns would occur in the South Deep watershed.

The effects of the alternatives on mapped recreational features (developed recreation sites, snowmobile and OHV routes, hiking trails, and dispersed camping sites) are discussed below for each type of proposed action.

Commercial Harvest and Transportation System

Unit ECG is near the Big Meadow Lake Campground and associated trails. The noise from nearby harvesting activities may disturb recreationists using these facilities, but user safety would not be compromised. This disturbance would be short-term, for the duration of the harvest activities. Signing the area prior to and during harvest activities to inform recreationists would mitigate the impacts.

The Blacktail Butte to lone snowmobile route passes through the southern end of the project area. Most of the harvest units in the Blacktail Butte and Seldom Seen Mountain areas would be hauled on one of the roads used by the snowmobile route (county road 4699 and Forest Service roads 7015000, 7018000 and 7015125). Harvesting and log hauling during winter months would make snowmobiling unsafe on this route. Closing the portion of the route in or adjacent to the units would disrupt the entire snowmobile route system because there are no nearby roads for snowmobilers to detour on. However, winter logging is recommended in some of these units because of existing levels of soil compaction. As needed, the snowmobile route would be closed prior to and during winter harvesting activities in this area. Users would be informed of closures through coordination with the Washington State Parks and Recreation Commission and media releases. Users would be displaced for the duration of harvest activities and log haul.

Reconstruction is proposed on county road 4699 and roads 7018000 and 7015125, which are part of the Blacktail Butte to lone snowmobile route. Reconstruction occurs during non-winter months, and there would be no impacts to snowmobile use.

The increased traffic of log haul for a timber sale or stewardship contract poses a safety hazard on designated OHV routes. To mitigate the hazard, haul routes would be signed, and OHV use would be restricted on roads used for harvest activities throughout the life of the contract.

New rock pit developments are the same in both action alternatives. The two new rock pits, and expansion of the existing Byers rock pit, are not near any dispersed recreation sites and would have no direct or indirect effects on recreation.

Precommercial Thinning

The units proposed for precommercial thinning are the same in both action alternatives. Units TBU and TBP have a groomed snowmobile route within them and unit TBN has a groomed snowmobile trail running along the northern portion of it. However, precommercial thinning is never done during the winter months due to snow depth, and there would be no effect on these routes.

Units TBD, TBW, and TBU have two dispersed recreation sites within 500 feet of them. Users of these sites may be disturbed or displaced by the precommercial thinning. Since these sites have documented recreation use, remaining slash in these units may have a higher risk of ignition by campfire or other human causes.

Post and Pole Removal

Post and pole units are the same in both action alternatives. The post and pole units are not near any dispersed recreation sites that could be impacted by this activity, and would have no direct or indirect effects on recreation.

Fuels Reduction

Fuels reduction actions are modeled to decrease the spread and intensity of wildfire events in the project area. They would not prevent such events, but could make them easier to control and reduce their effects.

Shaded fuelbreaks are the same in both action alternatives. Primarily vegetative removal and some prescribed fire would be done to reduce fuels in these areas. Most of the work would be done by hand. All fuelbreaks are along private/National Forest boundaries, and no dispersed recreation sites have been identified within 500 feet of these locations. There would be no direct or indirect effects on recreation from these actions.

Prescribed burning would occur both within commercial harvest units and in identified areas outside of harvest units. Although the proposed acres of burning differ between the action alternatives, the overall effects would be similar. All prescribed burning and pile burning is done when weather and fuel conditions are favorable for controlled burning conditions, generally in the spring and fall. Burning occurs on an average of about 12 to 20 days per year on the Three Rivers Ranger District. Signing is done along roads to alert motorists that smoke may be seen.

The Washington State Department of Natural Resources (DNR) manages air quality by regulating the quantity of burning throughout the year. Prescribed fire planned by the Forest service must be approved by DNR Smoke Management before ignition. When regional haze and/or particulate counts accumulate to predetermined limits, additional smoke emissions are prohibited.

No fuel reduction units are near any identified recreation sites under the action alternatives. Smoke from prescribed fires could temporarily impact visibility in the watershed and, rarely, could subside into the Aladdin valley during inversions. Smoke may cause discomfort for some recreationists, especially for those driving for recreation. Line of sight may be limited. With air monitoring and smoke management restrictions in place, this effect would be short-term. With signing, recreationists may relocate their activities for the affected days.

Visibility Protection Guidelines for the state of Washington's Class I areas place restrictions on prescribed burning during weekends from June 15 through October 1; however, these restrictions would not apply to the South Deep project area, as it is over 100 miles from any Class I areas (the nearest being the Pasayten Wilderness on the Okanogan National Forest). A project-specific mitigation to prohibit burns during Memorial Day and Labor Day weekends would avoid impacts during times of heavier recreation use of the area and help to mitigate the effects of smoke on recreational use in the project area.

Road Closure

Designation of a connected motor vehicle route system, which requires environmental analysis, is underway on the Colville National Forest. Resolving issues tied to designating motor vehicle routes and cross-country travel in the South Deep project area is deferred to the Forest-wide analysis and is outside the scope of this EA.

About 6.6 miles of existing road are proposed to be decommissioned in both action alternatives (Appendix B, Table B-6). Most of these are short road segments that have already been ripped and seeded, are growing in with vegetation, and are not passable with vehicles. National Forest System roads 7005790 and 7005830 are starting to revegetate. Road 7005790 has a slope failure that would be recontoured into a barrier, and road 7005830 would be closed with an earth berm. Closing these roads would not affect any future designation of OHV routes.

Cumulative Effects

Concerns about altering recreation opportunities in the South Deep watershed were expressed in scoping comments on the project. Their concerns indicate that there has been little change in recreation opportunities in recent years and users want to retain these opportunities unchanged.

Reasonably foreseeable future actions in the South Deep watershed are land management actions by private, state, and other landowners. Although the quality of recreational experiences (such as scenery, discussed in section 4.3.2) could be impacted by these other actions, they are not anticipated to alter recreational use in the project area. The desired ROS areas identified within the project area would remain unchanged by the cumulative effect of the actions proposed in this project and the other reasonably foreseeable actions.

Alternative E

Direct and Indirect Effects

In this alternative, commercial harvest units DCD, DCH, DCI, DCP, DFT, ECB, ECG, and WFB are at or near nine dispersed recreation sites. Harvesting may temporarily displace users of the dispersed sites. Since these sites have documented recreation use, remaining slash in these units may have a higher risk of ignition by campfire or other human causes.

Reconstruction of county road 4699 and Forest Service roads 7000500, 7000620, 7000655, 7000680, 7015125, 7005570, and 7005576 are adjacent to six dispersed recreation sites. Road reconstruction that occurs at or near a dispersed recreation site may temporarily displace users of that site. These sites would be signed to make recreationists aware of forthcoming activities and prevent access to the area for user safety. After reconstruction has ceased, the area would be cleaned up and debris would be cleared that could increase risk of fire caused by human activity. After reconstruction, better access to these sites could result in increased use of the sites. This would benefit some users, but could reduce solitude for others.

A portion of Forest Service road 700570 crosses trail 142 (outside of the South Deep project area). In this alternative, reconstruction of this road is proposed and could temporarily interrupt use of the trail. This interruption would be short-term and is not likely to affect recreation use patterns in the project area.

Alternative G

Direct and Indirect Effects

In this alternative, commercial harvest units DCD, DCH, DCI, ECB, ECG, WFB, WFD, WFG, WFQ, WFR, and WFW are at or near seven dispersed recreation sites. Harvesting may temporarily displace users of the dispersed sites. Since these sites have documented recreation use, remaining slash in these units may have a higher risk of ignition by campfire or other human causes.

Reconstruction of county road 4699 and Forest Service roads 7000500, 7000620, 7000655, 7000680, and 7015125 are adjacent to six dispersed recreation sites. Road reconstruction that occurs at or near a dispersed recreation site may temporarily displace users of that site. These sites would be signed to make recreationists aware of forthcoming activities and prevent access to the area for user safety. After reconstruction has ceased, the area would be cleaned up and debris would be cleared that could increase risk of fire caused by human activity. After reconstruction, better access to these sites could result in increased use of the sites. This would benefit some users, but could reduce solitude for others.

4.3.4 Range Resources: Effects of the Alternatives

The following range analysis is derived from the Range Resources Report for the South Deep Management Project and is available for review in the analyses file at the Three Rivers Ranger District office.

Alternative A – No Action

Direct and Indirect Effects

No action is defined as not implementing actions proposed under this environmental analysis. Timber harvest and prescribed burning would not be implemented.

Over the short-term, implementation of this alternative will result in little or no change in the range resource as it exists today. There would be no increase in road and stream crossings which would provide access to riparian areas by livestock. There would be no effect on current natural barriers providing allotment and pasture boundaries.

The opportunity to improve the range resource (construction of improvements) through Sale Area Improvement funds would not be realized. The most evident effect of this alternative to the range resource would be the loss of the opportunity to improve and expand the upland grazing areas available and accessible to livestock. There would be no effect on primary range and no increase in transitory range.

Alternative E

Direct and Indirect Effects

This alternative proposes to thin and/or salvage harvest, for approximately 4,606 acres, of which about 3,253 acres are expected to be more accessible to cattle (tractor units). The primary objectives of the proposed treatments are to reduce tree density and insect/disease effects, which will help reduce wildfires.

There would be no new access points to riparian areas created by new road construction. There would be no new accessible riparian areas because of harvest or burning. There would be a loss of 0.75 miles of pasture boundary on Meadow Creek Allotment and 1.6 miles of allotment boundary between Meadow Creek and Smackout Allotments.

This alternative proposes to reconstruct roads for a total of 74.5 miles of road and decommissions 6.6 miles of road. There would be no effect on Permittee operations because of decommissioning roads. Permittees would still be able to access their improvements and move livestock.

This alternative will result in an improvement in grazing opportunities. The creation of 3,253 acres of more-open stands available to cattle will improve forage availability for livestock. Burning would not be expected to impact livestock grazing. There would be no effect on primary range.

Alternative G

Direct and Indirect Effects

This alternative proposes to thin and/or salvage harvest, for approximately 7,121 acres, of which about 5,215 acres are expected to be more accessible to cattle (tractor units). The primary objectives of the

proposed treatments are to reduce tree density and insect/disease effects, which will help reduce wildfires.

There would be 2 new access points to riparian areas created by new road construction (access to DD', DF', units). There would be no new accessible riparian areas because of harvest or burning. There would be loss of 0.75 miles of pasture boundary on Meadow Creek Allotment, 2.3 miles of Meadow Creek Allotment boundary, and 1.6 miles of allotment boundary between Meadow Creek and Smackout Allotments.

This alternative proposes to construct 8.7 miles (permanent and temporary roads) or road and reconstruct roads for a total of 78.7 miles of road but decommissions 6.6 miles of road. There would be no effect on Permittee operations because of decommissioning roads. Permittees would still be able to access their improvements and move livestock.

This alternative will result in an improvement in grazing opportunities. The creation of 5,215 acres of more-open stands available to cattle will improve forage availability for livestock. Burning would not be expected to impact livestock grazing. There would be no effect on primary range.

Effects Summary

Table 4-33. Alternative Comparison Chart: Based on Natural Barriers Lost and New Access to Riparian Areas

Alternative	Total Miles of Natural Barriers Lost	New Access Points to Riparian Areas
No Action	0	0
Alternative E	2.35	0
Alternative G	4.65	2

Cumulative Effects

The cumulative effects of past timber harvest and roading activity, increased recreational use and development within the analysis area have all complicated the management of grazing within the analysis area.

In addition, between approximately 1975 and 1995 there has been a dramatic increase in the amount of roads and timber harvest units that provide access to riparian areas. In the past, many of these activities also prescribed the use of palatable forage species when seeding for erosion control. This created an environment that attracted cattle into riparian areas and provided desirable forage that kept them in these areas rather than moving on to natural upland range areas. However, past timber harvest activities have had a positive effect on grazing on these allotments. Timber harvest created openings in the forest which temporarily provided additional forage for livestock. When this transitory range is available, it reduces grazing pressure on primary and secondary range. Greatly reduced timber harvest levels (as compared to ten years ago) plus the switch from even age timber management to uneven age management has reduced the amount of openings in the forest and the resulting available forage.

The No Action alternative does nothing to reverse the condition of declining transitory range that is being lost as past timber harvest areas and natural meadows become occupied by trees. Declining transitory

forage gradually leads to decreasing numbers of cattle, decreasing season of use, or to increasing pressure on primary range and/or lowland riparian areas. This declining forage availability will likely lead to increasingly complicated management, which could lead to or contribute to reducing grazing on public lands in the project area. This reduced grazing could lead to increased difficulty in the permittees continuing in the livestock business, and could contribute to a decline in the ranching lifestyle and its contribution to the local economy.

Alternatives E and G, on the other hand, both should improve transitory range and make permit management less complicated. As a result, the action alternatives, in a small way, are expected to help the permittees stay in the livestock grazing business, which in turn should help maintain the grazing industry locally, and should help maintain the ranching lifestyle and the local economy.

4.3.5 Mineral Resources: Effects of the Alternatives

The following minerals analysis is derived from the Mineral Resources Report for the South Deep Management Project and is available for review in the analyses file at the Three Rivers Ranger District office.

The primary way that management activities directly effect minerals resources are their impact to existing mineral developments--survey/claim monuments, roads, workings or other improvements. An important indirect effect of management activities involves their effect on access to existing mining claims, leases, permits and mineral developments; or for future prospecting, exploration and development.

Alternative A – No Action

Direct and Indirect Effects

Implementation of this alternative will have no short-term effect to the mineral resources. Vegetation densities are expected to increase over the long-term. This may create more difficult access to mineral sites due to higher fuel loadings and brush. No impacts are expected to existing mining or mineral improvements or developments.

Effects Common to Alternatives E and G

Direct and Indirect Effects

Proposed road closures would have little effect on the accessibility of moderate and high potential mineral areas. Generally these areas would retain fair- to good-road access. The proposed closing of a segment of Forest Service Road 7020500 could affect access to the existing Wilkerson claim group in T37N, R41E, Sec. 21, SE/4. This road appears to be the only developed access to these mining claims and to the Polly Cabin located near the end of that road. However, the road has been grown in since about 1981. The stream crossing has also been washed out or possibly, was removed. Apparently the claimant hasn't used the road for some time. Closure will not require the construction of any additional barriers. Future proposals to redevelop road access to the Wilkerson claims by the claimant would require a separate NEPA analysis. That analysis would address issues associated with reconstruction of the stream crossing if the same access route were desired.

Alternatives E and G

Direct and Indirect Effects

Portions of five proposed tractor units (SDM, SDP, DDF, DDG, and DDO) are located within the $\frac{1}{4}$ sections for the Rocky Creek #1, #2, #3, and #4 claims. One proposed cable unit (SDF) is located within the $\frac{1}{4}$ section for the Wilkerson #1 and #3 claims. No management activities are proposed in the vicinity of the claims in the NW $\frac{1}{4}$ of Section 4. No new road construction is planned near any of the claims listed above. Moderate reconstruction is planned on County Road #4699 near the Rocky Creek #1, #2, #3, and #4 claims.

Timber harvest activities (felling, yarding, hauling, and site-prep) have the most potential to impact active mining claims in Rocky Creek. The most probable effect will be to corners or other claim markers. These effects will be short-term and will only last during the period of the timber sale contract. Longer-term positive effects will be a reduction in vegetation and down woody fuels.

Reconstruction of County Road #4699 may restrict mining access for short periods of time.

No prescribed burning is planned in any of the units identified above (Alternatives E and G) other than landing piles.

Cumulative Effects

There are no other reasonably foreseeable activities planned on Forest Service lands that could adversely affect mining claims or reduce access.

4.3.6 Costs and Revenue: Effects of the Alternatives

The following costs and revenue analysis is derived from the Economic Report for the South Deep Management Project and is available for review in the analyses file at the Three Rivers Ranger District office.

Alternative A – No Action

The No Action Alternative would not generate revenue.

Alternatives E and G

Most of the proposed actions incur costs. The proposed actions fall into two categories: Timber Sale (with associated transportation system) and Non-commercial Treatments (fuels reduction and precommercial thinning). The sale of logs under the action alternatives is the only activity that would provide revenue.

Timber Sale Cost-Revenue Analysis

To determine the viability of the timber sale proposed by the action alternatives, the value of the timber proposed for harvest was compared to the costs associated with harvest. The volume and species distribution of harvested timber per acre was based on the silvicultural analysis of timber stand exam data and field walkthroughs.

Costs include log yarding, hauling, erosion control, new road construction, reconstruction and maintenance, logging slash disposal, and reforestation and mitigation implementation. Costs were gathered from experienced costs, Forest averages, recent timber sale appraisals and Region appraisal programs. Because implementation personnel did not complete ground verification of logging systems,

road locations, and volume to be removed, adjustments to unit boundaries and road locations are expected.

The Net Value of the timber sales associated with the action alternatives is determined by subtracting the present costs from the present values. A positive Net Value indicates that values exceed costs and that Federal Treasury funds would not be used to implement the alternative. It should be noted that changes in market conditions and technology could alter the viability of a timber sale either positively or negatively. These conditions would be examined during the implementation phase of the project.

Both Alternatives E and G would generate positive Net Values (Table 4-34). In both alternatives, cable and helicopter logging systems are below cost (deficit) if considered separately.

Table 4-34 Economics Summary

	No Action	Alternative E	Alternative G
Timber Volume	0	29.8 MMBF (57,216 CCF)	47.1 MMBF (89,490 CCF)
Logging Cost	0	\$7,606,748	\$10,568,769
Delivered Product Value	0	\$12,472,278	\$19,527,367
Net Present Value	0	\$4,865,530	\$8,958,598
Total Jobs ¹	0	688 jobs	1076 jobs

¹ Uses a conversion factor of 0.012025 jobs/100 cubic feet (TSPIRS report, 1997).

The excess funds (Net Present Value) would be distributed to the Federal Treasury, road and trail fund, and mitigated sale area improvements. The minimum distribution that is mandatory return to the Treasury from timber sale receipts is 25%. After mandatory returns to the Treasury, Alternative E would have \$3,649,148 and Alternative G would have \$6,718,948 to distribute to the remaining funds. These amounts could be used to offset the cost of salvage sale fund (20-25%), activities not included in the timber appraisal (Table 4.38), and roads and trails fund (10%).

Non-commercial Treatments

Estimated costs for activities not included in the Timber Sale cost-revenue analysis (above) are given in Table 4-34. In both alternatives, all of these costs could potentially be offset with timber sale receipts.

Table 4.38 Estimated Costs for Activities Not Included in the Timber Appraisal

Work Item (unit of measure)	Cost per unit of measure	Alt E units of measure	Alt G units of measure	Alt E Cost	Alt G Cost
Jackpot burn (acres)	\$95	1775	2158	\$168,625	\$205,010
Grapple piling (acres)	\$220	171	978	\$37,620	\$214,160
Grapple pile disposal (acres)	\$35	181	11	\$6,335	\$385
Mastication (acres)	\$325	1116	1406	\$362,700	\$456,950
Shaded fuelbreaks (acres)	\$680	140	87	\$95,200	\$59,160
Whipfelling (acres)	\$130	1431	2962	\$186,030	\$385,060
Hand piling (acres)	\$500	37	46	\$18,500	\$23,000
Hand pile disposal (acres)	\$50	37	46	\$1850	\$2300
Landing pile disposal	\$27	115	178	\$3105	\$4806
Precommercial thinning, plantations (acres)	\$130	2137	2137	\$277,810	\$277,810
Precommercial thinning, Post Harvest (acres)	\$130	379	274	\$49,270	\$35,620
Snag replacement (tree)	\$75	553	855	\$41,475	\$64,125
Pre-treatment of noxious weeds (miles)	\$102	34	37	\$3481	\$3,864
Total costs not included in Timber Appraisal				\$1,252,001	\$1,732,250

4.3.7 Other Required Analyses

Environmental Justice

Executive Order 12898, issued in 1998, directed Federal agencies to identify and address disproportionately high and adverse human health and environmental effects, including the interrelated social and economic effects of their programs, policies, and activities on minority and low-income populations in the United States. Environmental Justice means that, to the greatest extent practicable and permitted by law, all populations are provided the opportunity to comment before decisions are rendered on government programs and activities affecting human health or the environment (USDA 1997), and are allowed to share in the benefits of, are not excluded from, and are not affected in a disproportionately high and adverse manner by these programs.

Environmental justice reviews typically require two components: first, an analysis of the racial and ethnic composition and percentage of the population below the poverty level of people living near the project sites; and second, the analysis must explain how the scope of potential impacts from the project is unlikely or likely to be significant, high and adverse. If there are no significant high and adverse impacts, then even with protected populations nearby, there is no opportunity for them to disproportionately experience high and adverse impacts. It is important to both document the presence of any protected minority and low-income populations, and to explain why impacts would or would not be significantly high and adverse.

In examining the South Deep Project, two potential minority and low-income populations may be affected: Tribes of the Colville Reservation and low-income residents of Stevens and Pend Oreille Counties.

Tribes of the Colville Reservation

The Tribes of the Colville Reservation claim “traditional use” of the South Deep Creek watershed and were included in project scoping and thus were informed and invited to consult on the proposed actions. No response was received from the Tribal Council or any tribal members.

Low Income Residents of Stevens and Pend Oreille Counties

The South Deep alternatives were analyzed for their effects on low-income people who use the area for subsistence activities. Hunting, firewood gathering, and huckleberry picking constitute the primary subsistence activities in the area. The action alternatives are expected to increase browse for game species, consequently, subsistence hunting would improve. A slight increase in firewood gathering opportunity is expected in the short term. Huckleberries generally respond to decreased competition for sunlight. Accordingly, subsistence huckleberry gathering is expected to benefit from the action alternatives. Fishing would not be affected.

Changes in the availability of firewood would likely affect low-income residents more than others because alternate sources of heat are more costly. The South Deep project would temporarily open several existing roads for timber harvest, and Alternative G would construct 4.9 miles of new roads. These roads would be left open for firewood gathering for the duration of the project. Firewood (snags and downed wood that has been behind road closures, and logging slash created by the project) would be more available for a few years as a result of the South Deep project. Most of the roads proposed to be decommissioned are currently closed with vegetation, and their closure would have a minimal effect on access to firewood.

In the case of a timber sale, the relevant impacts would be in the form of disturbances to resources that are used by low income or minority populations such as air quality impacts from burning, or temporary loss of access to an area where hunting, firewood gathering or fishing could occur for subsistence.

The action alternatives would contribute to consumers, but only in a limited capacity. Both action alternatives would provide wood products to one or more area sawmills, thus contributing raw materials that would become available to consumers. Because the amount of such material is small when compared to the regional wood products market, making this material available to the market would not measurably affect the price or availability of finished wood products.

After considering the effects of the proposed actions on subsistence activities, neither of the alternatives would impose any disproportionate adverse human health or environmental effects on minority and low-income populations. All contracts and employment offered by the Forest Service contain Equal Employment Opportunity requirements. Therefore, no adverse or discriminatory effects to Civil Rights, Minority Groups or Women are expected with regards to access to federal contracts or jobs.

Effects on Farmland, Rangeland, and Forestland

The South Deep Project area (National Forest System lands) contains no farmland. Effects to rangeland and forestland are discussed in the resource reports and the environmental assessment (Sections elsewhere).

Effects on Wetlands and Floodplains

Effects on wetlands and floodplains are discussed in the Hydrology and Fisheries Report in the Analysis File, and are summarized in the Effects section of this Environmental Assessment.

Short-term Use vs. Maintenance and Enhancement of Long-term Productivity

The proposal is intended to restore and maintain sustainability and long-term productivity. Short-term and long-term effects are discussed for the various subjects in the Effects section of this Environmental Assessment.

Adverse Effects that Cannot be Avoided

Under both action alternatives, complete prevention of noxious weeds invading disturbed soils is not possible. Mitigation measures are prescribed that would be expected to substantially reduce weed invasion onto new sites, and to reduce weed spread from existing noxious weed infestations. Given the control measures proposed in the *Environmental Assessment for Integrated Noxious Weeds Treatment, Colville National Forest* (1998) to reduce existing weeds, and prevention measures included in the *Colville National Forest Weed Prevention Guidelines* (1999) and *Preventing and Managing Invasive Plants Environmental Impact Statement and Record of Decision (October 11, 2005)*, the overall impact of implementing this project is expected to be beneficial in terms of forest health, but the extent and intensity of noxious weed infestation would increase. Additional discussion of effects on noxious weeds is included in the Noxious Weed Report in the Analysis File.

Soil compaction and erosion as a result of logging is unavoidable. Sediment from soil-disturbing activities reaching streams is unavoidable. Many of these unavoidable effects are substantially mitigated by Best Management Practices included in the Environmental Assessment. Further discussion is included in the Soil and Watershed Reports in the Analysis File.

Smoke from burning forest fuels is unavoidable. By burning within prescription parameters documented in project Burn Plans, potential adverse effects will be substantially reduced. Adverse air quality effects from prescribed burning will be substantially less than would result from the same forest fuels burning under wildfire conditions. For more discussion about smoke and air quality effects, see the Fuels Report in the Analysis File.

Snags and downed logs will be unavoidably lost as a result of timber harvest and prescribed burning. However, sufficient numbers will be left, and replacement cavity nester trees created so that Forest Plan standards (including Screening Direction) will be met, and additional snags and downed logs will be created by prescribed burning and subsequent secondary tree mortality. Regardless, adequate snags and down logs will be retained to meet Forest Plan standards and thus maintain viability of dependent wildlife species. For more discussion, see the Wildlife Management Indicator Species Report in the Analysis File.

Winter harvest of some units would result in temporary closure of some snowmobile routes.

Conflicts with Objectives of Other Land Management Plans, Policies, and Controls

A presentation on the South Deep Management Project was made before the Stevens County' Federal Lands Advisory Council and scoping letters were mailed to the Council and the Stevens County Commissioners. No comments were received.

Public Health & Safety

There are a substantial number of health and safety hazards to Forest Service employees and private contractors involved with carrying out of either of the action alternatives. There are no hazards identified that are unusual or unique to the South Deep Project. The health and safety hazards to Forest Service employees and contractors are addressed by the USDA Forest Service Health and Safety Code (Forest

Service Handbook 6709.11), and by Occupational Health and Safety Administration (OSHA) requirements. Analysis of these health and safety hazards will not be repeated here.

For the general public, there are a number of potential health and safety hazards.

Smoke

Smoke in large amounts is not expected to affect the general public because burning would only be done when smoke will be readily dispersed into the upper atmosphere. Also, the public is not expected to enter areas where burning is actively in progress because signs warn against public entry. Smoke in lesser amounts, as may occur when smoke settles into valley bottoms during evening hours following prescribed burns can reduce visibility. It is not expected that visibility would be reduced to the extent that driving safety would be impaired. Valley-bottom smoke can also adversely affect the breathing of a small number of susceptible individuals. The Forest Service routinely announces to the public in advance when burning is to take place, so that susceptible individuals can take the necessary precautions to avoid adverse health effects. For more discussion about smoke and air quality effects, see the Fuels Report in the Analysis File.

Dust

During dry periods when unpaved roads are used in conjunction with any activity associated with the project (especially log hauling and rock pit blasting, drilling, and crushing), dust will occur. In most cases, dust is not considered a serious health and safety hazard. However, in severe instances (which are occasionally associated with log hauling), visibility can be severely reduced, and breathing, especially in certain individuals, can be adversely affected. See the discussion on rock pits in the Fuels, Fire and Air Quality section of this chapter (Section 4.1.3).

Increased Traffic

Implementation of any of the action alternatives will increase traffic on roads within, and leading to, the project area. Log haul traffic increases the chance of vehicle accidents. For more discussion, see the Recreation Effects Report and mitigation measures in Chapter 2 (2.2.6 Transportation System Activities, Haul Route Safety).

Logging Hazards

The general public is routinely advised (with warning signs) to stay out of active logging areas. Where logging occurs along main open roads, the Timber Sale Contract contains provisions to protect the public while passing through the logging area. As a result, the risk to the general public from logging (other than traffic hazards discussed above) is very small. Such hazards include falling trees, debris on roadways, rolling rocks or other material, and encounters with moving logging equipment.

Prescribed Burning Hazards

The general public is routinely advised (with warning signs) to stay out of active prescription burn areas. During aerial ignitions, no one is allowed inside the ignition area. As a result, the risk to the general public from prescribed burning operations is very small. In addition to smoke (discussed above), the health and safety hazards to members of the public who enter active burn areas include being burned, being hit by falling trees or rolling material, stepping into stump or root holes, or being hit (and/or burned) with flammable materials used to ignite prescribed fires.

Weed Treatments

Health and safety effects from treating noxious weeds are found in the *Environmental Assessment for Integrated Noxious Weed Treatment, Colville National Forest* (1998).

While there are health and safety hazards associated with the South Deep Project (listed above), there are also public health and safety benefits.

Improved Road Safety

Public safety on Forest roads would be improved following timber sales. Roads that are reconstructed for timber sales that are to be open to public use following the timber sale include measures to enhance public safety (i.e. wider curves, more frequent turnouts). In addition, road maintenance is accomplished on all roads used for timber sales, resulting in improved visibility and smoother running surfaces.

Reduced Wildfire Risk

Implementing any of the hazard-fuel management actions will result in reduced risk of large wildfires that can threaten public health and safety.

Unique Characteristics of the Geographic Area

The South Deep Project area contains no unique characteristics or features. There are no park lands, prime farmlands, wild and scenic rivers, ecologically critical areas, congressionally designated areas (such as wilderness, wilderness study areas, or National Recreation Areas), Research Natural Areas, or municipal watersheds. There also are no inventoried roadless areas. The area does contain steep slopes and erosive soils, threatened or endangered species or their habitat, floodplains and wetlands, and cultural sites; however, the effects to these resources have been examined in the Environmental Assessment, and there is nothing noted about these features that would suggest that they are unique, or that associated effects would be significant.

The Degree to Which the Effects are Highly Uncertain or Involve Unique or Unknown Risks

There were no highly uncertain, unique, or unknown risks identified in any of the effects analyses conducted for the South Deep Project.

The Degree to which the Action may Establish a Precedent for Future Actions with Significant Effects

None of the proposed actions in the action alternatives set precedents. The Three Rivers Ranger District has been conducting timber sales and prescribed burns for years; many of which are similar in scope and nature to those proposed in the South Deep Project.